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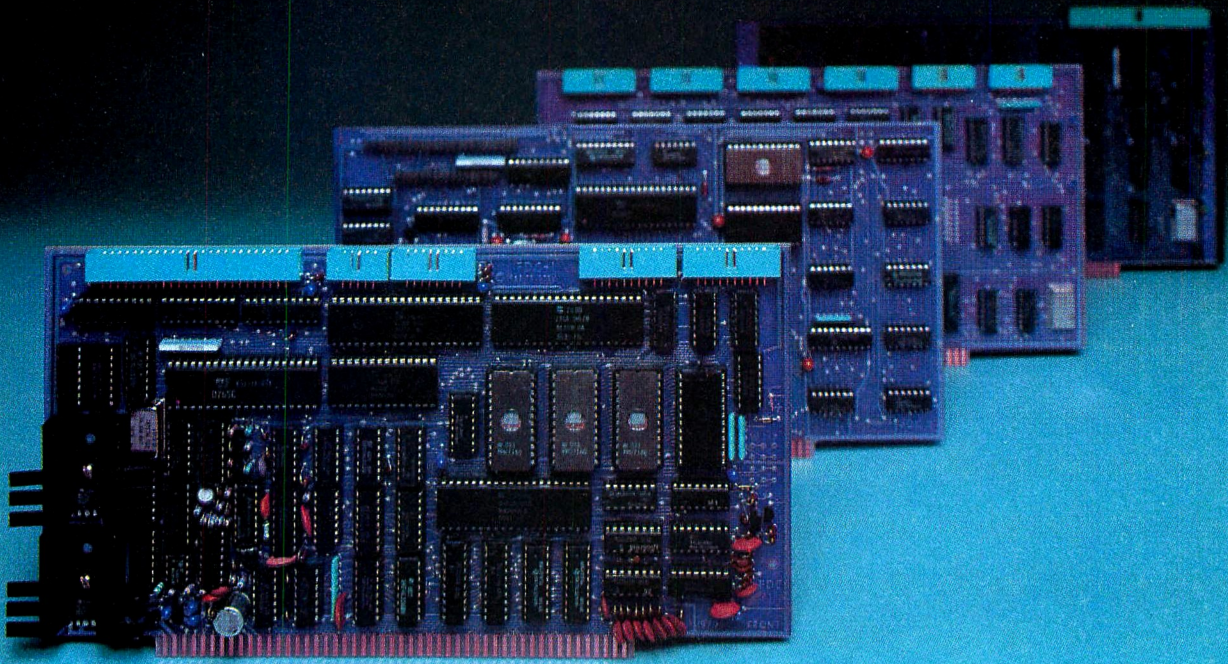

TELETEK's memory board rounds out our family of high-technology IEEE S-100 boards by offering the highest performance to cost ratio in the industry. They're powerful, usable, and they fit-together and in your system.

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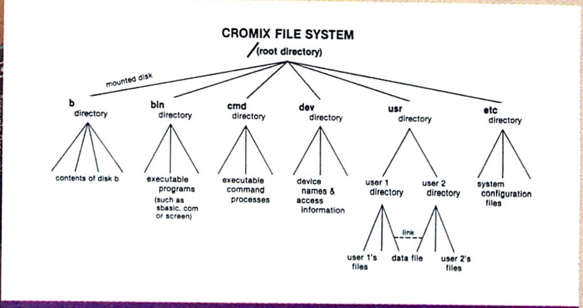

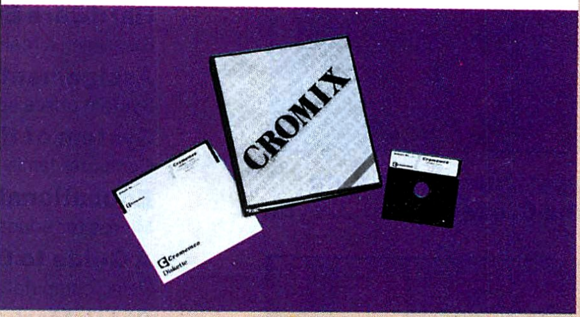

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- Multi-user and multi-tasking capability
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- Completely compatible file, device, and interprocess I/O
- Extensive subsystem support

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The power and breadth of its features make CROMIX the standard for the next generation of microcomputer operating systems.

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COMPUTING FOR BUSINESS AND HOME APPLICATIONS

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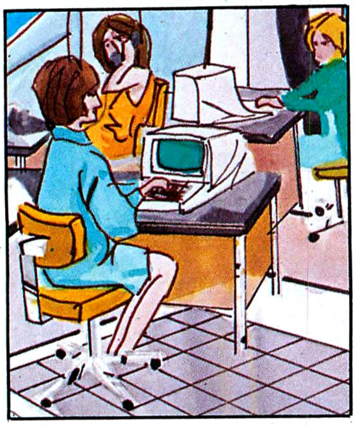

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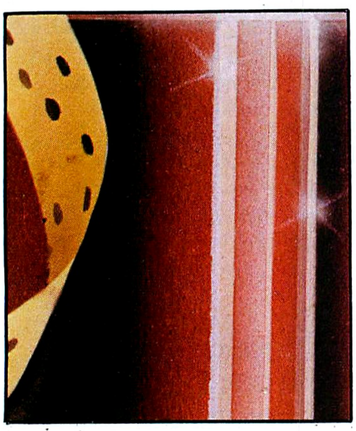

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COLUMNS

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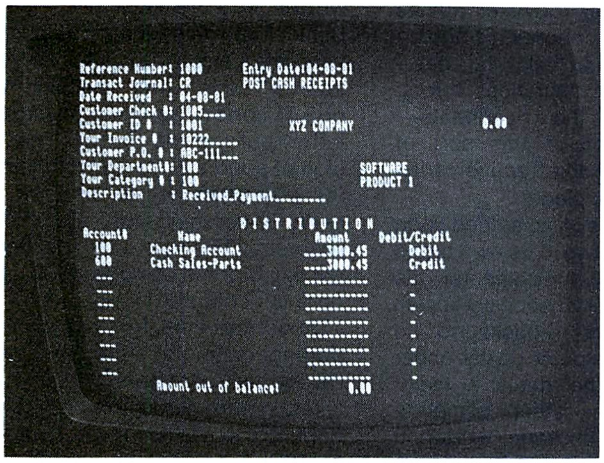

Typical screen format - actual photograph.

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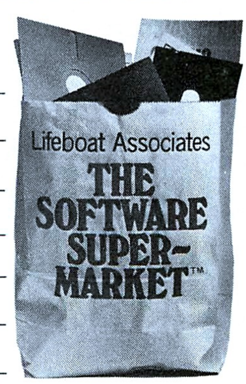

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CIRCLE INQUIRY NO. 47

EDITOR'S NOTEBOOK

A Grim Fairy Tale

This is not a pretty story, but it's a true one, so far as we are able to determine.

The central character is a computer, and the tale has good guys and bad guys. The real villains turn out to be people, not machines—although it points out that computers are just as blindly obedient serving evil deeds as honorable ones.

About two years ago, an established medical clinic in a large American city turned to a computer for help with its daily bookkeeping chores. Logging patient visits, creating bills and statements, filling out insurance forms, keeping track of the deadbeats—computers are good at this sort of tedium, the kind that so effectively tries the patience of loyal clerks.

Casting around, the clinic settled upon a local business dealing in its own brand of computer. Actually, the computer was one of the more popular nationally-known large microcomputers, re-packaged and re-labeled by the computer dealer under its own banner. The dealer's major contribution was a rather complete medical accounting package, written in Basic. We've seen it work and are impressed with the thought and planning lying behind the programs. They demonstrated well, and the clinic plunked down about $35,000 for the hardware/software system.

Business was good, and that dealer installed something over a dozen similar systems in the same city. There must have been some time pressures, however, because the medical accounting programs delivered to the purchasers were far from ready for service. They were full of bugs—programming errors easily glossed over during a sales demonstration, but fatal when required to keep track of real patients and real money in a live business situations.

No problem, said the dealer...we'll fix it. And they did, or at least made a mighty attempt. The work was nearly complete when the computer dealer failed as a business. They went bankrupt.

What did the clinic do when this happened? What would *you* do about it? The computer itself works well. The software package *almost* works; in fact, works well enough that the clinic by this time was utterly dependent upon the mechanical marvel to perform its daily business.

The clinic owners called the computer manufacturer to determine who, in their area, could take up the work. They found a hardware maintenance firm and purchased a satisfactory maintenance contract. They contacted a local software house experienced in that brand of computer. So far, so good. The programmer showed up one day, ready to dig into the medical accounting package. The first hint of trouble occurred when he said, "Show me where you keep the source code, and we'll get right to it."

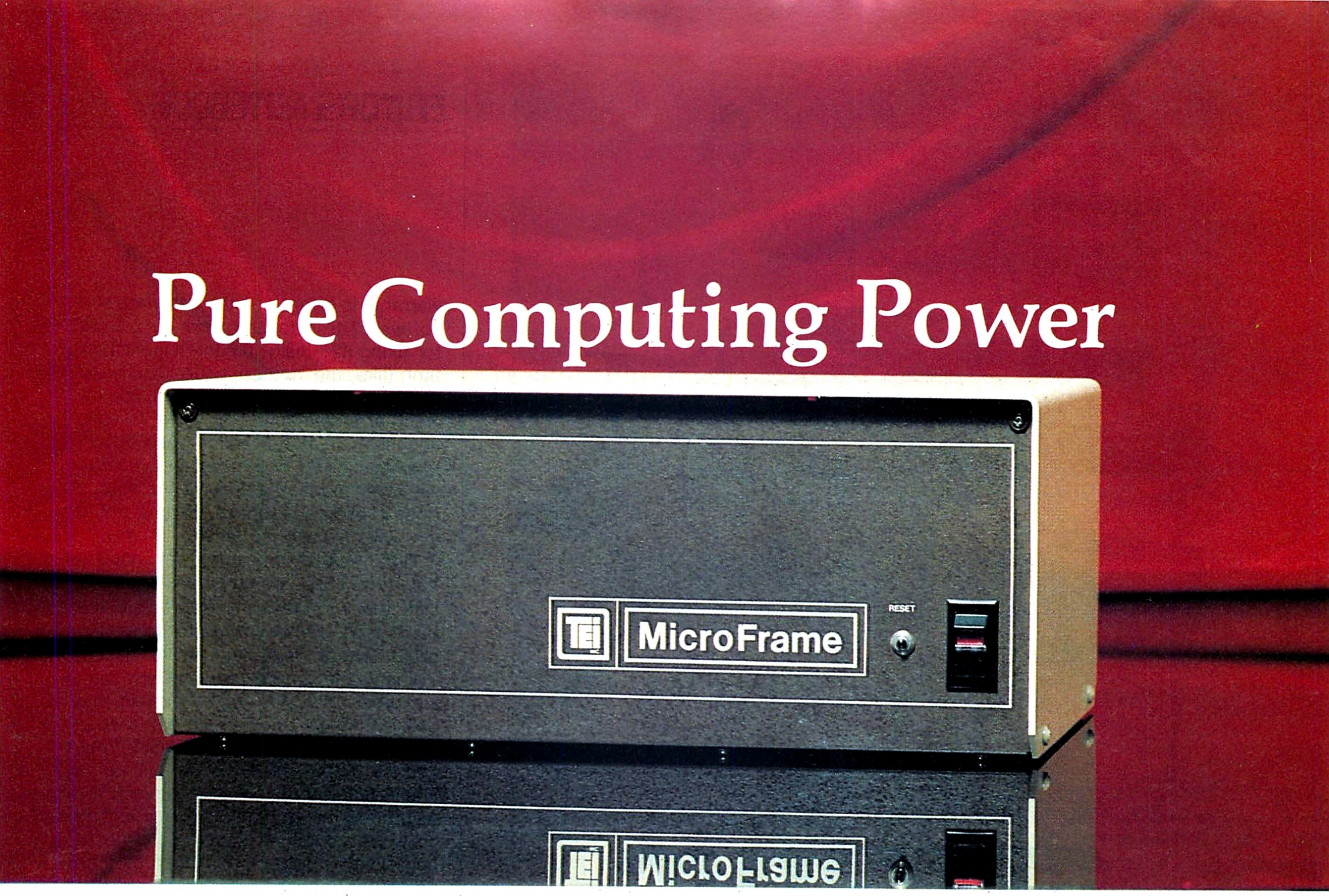
The medical accounting package was written in a semi-compiled version of Basic. With this kind of language, two versions exist: the human-readable source code, and machine-readable object code. The clinic possessed the latter, but not the former. The possession of source code is utterly necessary for a programmer to alter, correct or even understand the operation of a program. (The rare "de-compiler" does not exist for the compiled Basic language on this computer.)

About this time, an ex-co-owner of the defunct computer store contacted all of his former customers with an offer: For a retainer of $300 a month, he would continue to service the software on the scattered computers. Service, in this case, meant continuing to fix the still-resident program bugs. Alternatively, he would sell a copy of the Basic source code for the rather arbitrary price of $10,000 to $12,000. (The offer varied between customers.)

Some of the clinics went for the deal, and are now receiving this software service. Others rebelled against the idea, a few to the extent that they junked the software *and* computer rather than acquiesce to what was, in their view, an unethical business practice. For this programmer essentially held the source code hostage. How would you respond?

The case is heading towards the courts; that's why we are hesitant to publish names and places. What you read here is the issue as seen through the eyes of a burned purchaser. The ex-dealer hasn't responded to our calls to hear his side of the story.

What can prospective computer purchasers learn from this debacle? A lot of things, actually, but this is paramount: know what you are trading your money for. Pin down *exactly* what is to be delivered with the computer, and included in the agreed-upon price—what hardware, which programs, what kind of service, how much training, how many manuals. Most important, what kind of



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CIRCLE INQUIRY NO. 81

warranty is offered on the hardware *and* software? If it doesn't work, who pays for fixing it? Finally, if something important (like the source code discussed above) is not included with the computer, what arrangements are there to gain access to it if the seller goes out of business? A lot of respectable vendors will offer to place a copy of the source code in escrow against such an event, if you will only ask the favor.

But none of this does any good if you don't know the questions to ask, or lack the knowledge to appreciate the responses. In their first letter to us, the clinic whose tale lies above asked, "What is the source code and why can't we break it?" We had to explain that unlike Enigma, the German battle code broken in World War II by British intelligence, "the source code" is not a single magical key that can unlock the mysteries of the medical accounting software. Such an important concept had clearly not been explained by their computer vendor.

And you can't expect *your* computer dealer to explain everything to you, either. As we've stated before on this page, there are some businesses who feed on customer ignorance. *Caveat emptor. Learn* about your new purchase.

Something to shoot for

Our informal speed competition for microcomputers (IA Aug 81) continues to attract new and interesting contestants. The latest is the dreaded Cray 1, reputed to be the fastest computer in existence. Perhaps you've seen pictures of the Cray—the various boxes arranged in a circle to minimize the travel time for electric signals passing back and forth between them. The monster is fundamentally a 64-bit processor with a cycle time of 12.5 nS, giving a speed of 80 MHz. Memory size is up to 32M bytes. Our Prime Number Cruncher had to be converted into compiled Fortran before the Cray would accept it. The result: 32.86 mS to compute *all* prime numbers up to 1,000. That's just three hundredth-parts of a second, over 60,000 times *faster* than a Radio Shack model I! The record attempt was passed on to us by Robert Wellck of Cray Research, Boulder, CO, whose job includes coming up with benchmarks to prove his cruncher to be the fastest in the world. It looks as if he has done it again. ***—TF***

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“I would prefer Verbatim Datalife over any brand I've ever used.”
Skip Piltz
Overland Park, KS

“My experience with Verbatim diskettes has been excellent. I've used several boxes over the past few months and they've all been error-free.”
Robert Roeder
Las Vegas, NV

“Much stronger, better centering. A definite improvement.”
Leroy LaBalle
Marrero, LA

“It has worked perfectly everytime!”
Richard Ruth
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“I like the thicker protective cover.”
David Hendel
Lititz, PA

“Great! I have had *no* problems!”
Timothy Roscoe
Mechanicsburg, PA

“So far my Verbatim disks have been performing flawlessly. Not always so with other disks.”
Chris Otis
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Bob Mills
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Gary Sandler
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Howard Chin
Pomona, CA

“Thank you for the improvements. Just another reason why I'll always use Verbatim.”
James Hassler
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CIRCLE INQUIRY NO. 89

LETTERS

Monumental task

I am a bewildered software buyer trying to select an accounting package, a DBMS and a financial planning program for my CP/M system. If your magazine were to publish a special report in which experts in each of the three fields compared all offerings on a feature-by-feature basis and presented the findings as you did in the Jan 81 issue, scores of small businessmen would rush to buy it. There simply are too many offerings in each of these areas for buyers to read all the manuals before selecting a package.

Sanford Fleisher
Philadelphia, PA

The value of benchmarks

Re: Tom Fox's benchmark (IA Aug 81) on WaveMate series 2000, 2MHz 6800 microprocessor (an 8-bit CPU), the software used was the SD Business Basic Compiler V1.4 with 10 digit software BCD floating point routines, running under the SDOS operating system. It turned in a time of 316 seconds, which outperforms all 70 of the microprocessor/software combinations listed in the benchmark article, except TEI's (which ran twice as fast at three times the price); it also outperformed about half the minicomputers listed.

I really don't think that the benchmark listed is appropriate for determining how "good" a system is at solving a problem; most of the small business computers are disk I/O bound anyway (perhaps a better benchmark would be one that reads 1000 records from a file). But I think that the real importance of a good benchmark is that it indicates that the vendors have put considerable amounts of energy into the hardware/software combination, and that means other system features are probably as well thought out.

Ira D. Baxter
Anaheim, CA

On Commodore CBM

Re: System of the Month: Commodore CBM (IA Jul 81) by Tom Fox, I am a bit offended that such an article was published in your magazine in July 1981, not July 1980!

First and foremost, Mr. Fox addressed this system as the CBM. Unfortunately for your readers, the system is in fact a Pet, a graphics computer, designed for the hobbyist. This was the original CBM thrust. However, at the same time that the Pet 2001 computer was introduced, a CBM Business computer was introduced, which had essentially a typewriter keyboard and not the keyboard he described. And it was labeled a CBM, not Pet. The CBM in many ways was similar to the Pet, but those of us with Pets can tell you that it is a real pain to switch to a CBM keybord and not have our graphics characters as readily available, but the CBM was designed for the business type of use.

Yes, the Pet/CBM interface to the disk was awkward up until about a year ago when Commodore introduced the disk operating system (DOS) 2.x and Basic 4.0. Since that time, interfacing with the disk has become a pleasure.

No, you won't find a bell on the system you examined. About a year ago, Commodore introduced the CBM 8032 as a serious business system. This computer corrected most of the things that were criticized in your article.

Gerald Key
Gahanna, OH

The system reviewed is, indeed, classified as CBM—not a Pet model. **—TF**

Future of video disks

Re: "Learning with Micros" (IA Apr 81), Louis Frenzel laments the death of the video disk/computer combination. I am upset with Mr. Frenzel and other's lack of an overall view of the video disk/tape arena. Looking at general distribution patterns of program information indicates that the consumers and producers are very comfortable with the read-only disks otherwise known as long playing records. Inherently, the video disk/computer learning station is more effective than slides, movies and printed material, with features like programmable slow motion, reverse motion and single frame.

The video disk/computer (VDC) is immature at this point and very expensive. Who will provide money for basic R & D to lower the cost of disk program production, and disk and player manufacture? Who has lots of money and needs to train a huge work force quickly to use high-tech machines? The defense department has been experimenting with VDC units. The results have been promising. The bottom line, from my point of view, is simply that the eventual adoption of the video disk as a universal program medium is inevitable. The question is how long and who will do it.

Thomas K. Fitzgibbon
New York, NY

Infant industry

In the July letters column, Alan Sugarman suggested a comparison of

WordMaster or WordStar word processing programs against the Wang 5 or 25, and felt that the Wangs were superior to the aforementioned software. Although unfamiliar with Wang, I have no doubt that this is true. When I read reviews of word processing software for microcomputers, I wince at how primitive they are, as I'm sure Mr. Sugarman does.

Microcomputer word processing is in its infancy. This is also evidenced by observing that the majority of articles on computerized word processing are still attempting to show the reader the advantages of typing onto a CRT rather than paper, and pointing out the ease of revisions, corrections, etc. The sophisticated users know this already; their primary concerns are with flexibility, ease of use, operator/technical support, and comparing features of the different makes of systems. Microcomputer word processing articles seem to be primarily concerned with "Since you already have a computer, this is why you should be using it instead of a typewriter." This is analogous to discovering how much you can increase your productivity by changing from printing with a crayon to using a manual typewriter—all well and good for those who are using crayons, but those of us using Selectric IIs can only wonder what the fuss is all about.

Ryan Gale
San Diego, CA

More cleaning tips

Re: "Maintain your Memory" (IA Jul 81), I feel it should be noted that any alcohol base cleaner will leave a film on the head. This will cause the head to pick up dirt readily. Cleaners that do not have an alcohol base (found easily on the market) should be used.

The belt drive system should not be cleaned as often as the head, pinch roll, and capstan, but should be cleaned periodically. This is because the belt will also get dirty and, in most cases, hard usage will leave a build up of rubber on the motor pulley and capstan pulley. This will cause the tape to play at erratic speeds, causing data errors. Also, since belts do stretch, causing variable speeds, these should be checked and replaced if necessary.

If you take the cleaning and maintenance of a tape player lightly, the dirt build-up on the head, capstan, and pinch roller transfers back onto the tape, covering up your stored information.

Robert J. Utley
Camp Hill, PA

Reader interface

I have been reading the "Micro Mathematician" columns for several years, but you have not touched upon logarithms. I need to obtain the natural logs of integers between 0-256, in assembly language for an 8080. I could use a look-up table, but this would take a fair sized table. The methods I know of would be involved without floating point mathematics. I would be grateful for a clue or some references.

The project involves analysis of the equation $P_t = P_o e - t/RC$ in the vascular system. I have the wave form and need to solve for RC:

$$RC = \frac{t}{(\ln_e P_o - \ln_e P_t)} = \frac{t}{(\ln_e (P_o/P_t))}$$

5% error would be acceptable.

U. Scott Page, M.D.
N.W. Surgical Assoc., P.C.
2226 N.W. Pettygrove
Portland, OR 97210

I have just purchased a new computer system, consisting of an Apple II Plus (with 48K RAM), an integer card (thus allowing use of both Applesoft and Integer Basic), an Apple disk drive and controller (with DOS 3.3), a small B&W monitor, and a Centronics 737 printer. I am interested in buying a word-processing/text-editing program and an 80-column, upper/lower case conversion card for my monitor. I intend to use this package for personal letter writing, English-lanugage translation of foreign-language text, and publication of a newsletter/bulletin. I would very much appreciate suggestions on both the software and the 80-column, uc/lc card.

Terry L. Newstrom
616 W. 53rd St., Apt. 306
Minneapolis, MN 55419

I am a Vector Graphics user and I was very pleased to see the article about Memorite and Execuplan ("Business Software Review," IA Jul 81).

Carl Heintz mentioned that the mailing list could not sort by zip code. The sort software with Memorite allows sorting on any field in the address. In fact it is possible to enter a special character in the middle of a field and sort from that point in the field. Names can be entered normally, then the list can be sorted on last name. While this program is called a mailing list, the fields are user definable. I can keep any kind of list by defining the prompts and field definitions. I have my wine inventory and a recipe catalogue on modified mailing lists.

Second, if there is a problem with Vector Graphic ownership, it is the lack of user groups and dealer support in

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forming them. If there are any Bay area Vector Graphic user groups, I would like to hear from them. Or if anyone would like to form a group, I would like to hear from them.

John Middleton
4143 Carol Ave.
Fremont, CA 94538

I would like to hear from your readers who are interested in using computers for the patients who are either disabled or paralyzed and confined to the hospital or nursing homes. I think that there could be tremendous help for disabled people who could be trained to provide service through computers, either at their homes or in nursing homes, though they can't walk because of paralysis or disabilities. Any help in this regard would be a tremendous service.

F.A. Choudhri, M.D.
900 W. Clairemont Ave.
Eau Claire, WI 54701

Is any manufacturer presently marketing a video display board for S-100 bus computers that projects characters 132 columns wide?

Aaron M. Epstein
Patio Computer Sales Co.
Suite 204
5451 Laurel Canyon Blvd.
N. Hollywood, CA 91607

I am using four Radio Shack model IIs, all imported from various sources in America. Some have been converted to 220 volts at 50 cycles in the states and some are done in Hong Kong. Sometimes I find that the diskette prepared in one computer may not be always useful in another—causing I/O errors especially when dealing with files. The problem I was told, lies with the Shugart drives, which may be for 60 cycles only. I would appreciate any suggestions.

Peter P.F. Chan
Buddy Electronics & Systems Ltd.
12 Moorsom Rd.
Jardines Lookout,
Hong Kong, China

Where credit is due

Statistics listed in the August article "Computing to Work" were erroneously attributed to the University of Southern California's Center for Futures Research. Credit for the research should go to Jack M. Nilles, who conducted the study through the Office of Interdisciplinary Programs at U.S.C. The complete study, *Telecommunications — Transportation Tradeoff* was published in 1976 by John Wiley & Sons, New York, NY.

Most small system users think all microcomputers are created equal. And they're right. If you want performance, convenience, styling, high technology and reliability (and who doesn't?) your micro usually has a price tag that looks more like a mini. It seems big performance always means big bucks. But not so with the SuperBrain!

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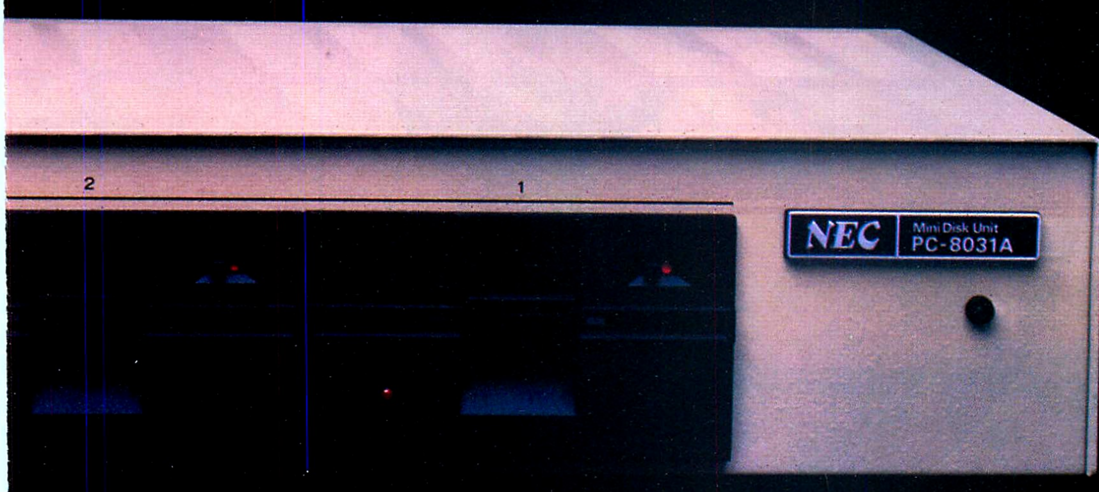

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†TM Apple Computer Inc. Micromodem II can also be used with the Bell & Howell computer.

IBM enters personal computer market with low priced system

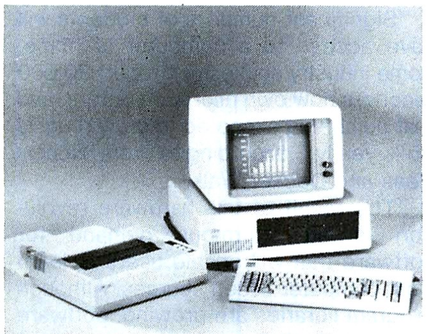
IBM Corp., Baton Rouge, FL, traditionally a leading manufacturer of mini and mainframe systems, has made its firmest commitment yet to compete in the low-cost personal computer market. The company recently announced the release of a personal computer system in the under-$2,000 price range.

The system will be marketed through ComputerLand retail stores and Sears, Roebuck and Company's business machine outlets.

Features include an 83-key adjustable keyboard, up to 262,144 characters of user memory, a printer that can print in two directions at 80 characters per second, self-testing capabilities that automatically check the system components and a high-speed 16-bit microprocessor. The system can generate and display charts, graphs, text and numerical information. Many business applications can also be run.

Included with the system are an enhanced version of the Microsoft Basic language and operating manuals written at an elementary level to accommodate the inexperienced user.

A basic unit for home use attached to an audio cassette player and television set sells for approximately $1,565. A more advanced system with a memory of 64,000 bytes, a single diskette drive and a printer sells for about $4,500.



Robot designed to overcome consumer resistance

Computerized, mobile machines—like C3PO and R2D2—are about to take one giant leap off the science-fiction movie screen and into the home and workplace, according to Ken Davis, inventor of Reggie, the Robot. The marketing plan of General Development Company, Phoenix, AZ, calls for a mid-1982 sales date for the second generation robots, which will take on a variety of industrial and household tasks for a price tag of under $10,000 each.

"I wanted to build a true robot, one that would operate under its own power and respond to human questioning," says Davis. "But I didn't want people to be afraid of it." A marketing research study conducted among some 3,000 people led Davis to discover some unusual things about people that would have to be incorporated into his robot design.

"We found that science-fiction, especially in movies, had left in the subconcious the impression of robots going berserk and killing people. Because of this, an astounding 85% of our interviewees wanted a machine that did not have arms and legs. If the robot *did* have arms and legs, people said they would still look at it, but they would not get close to it."

Davis also found that people wanted a robot to be under five feet high so they wouldn't have to look up to it, and they wanted it to have a personality so they could relate to it as a friend and workhorse, rather than a machine.

Reggie 1 is just under five feet tall,

moves independently via wheels and, through voice synthesis, is capable of selecting key words from among 40-50 of the more common questions asked of him and then formulate his own reply.

Though designed as an entertainer, Reggie's next generation brothers will be working at more serious occupations. Davis' company is already working on a version for security intrusion, though it will be designed for multiple duties through plug-in modules.

College seeking exchange of educational programs

The West Virginia Career College is training students in practical uses of microcomputers in business. More and more small businesspeople (and departments of large corporations) are adopting personal computers into their work, so the college is attempting to orient its instructions along these lines.

The school uses Apple II, Apple III, and TRS-80 machines in its classes. Students in the computer education program receive instruction in general computing theory and hands-on experience with important programs and concepts, such as the "big five" (general ledger, payroll, inventory, accounts payable and accounts receivable), VisiCalc, and economic simulations.

The school is interested in developing exchanges of programs and ideas with other business schools, either by sending program media through the mail or possibly by use of an exchange medium such as filespace and electronic mail in a service like MicroNet. More information is available from Chris Gundlach, West Virginia Career College, 536 Fifth Ave., Huntington, WV 25701.

University steps up its computer education efforts

The Stanford School of Education, Stanford, CA, has introduced a new Master of Arts degree program in interactive technology. It will combine courses in computer science, educational psychology, and curriculum theory and design.

Graduates will be prepared to apply educational technology to improve educational resources of schools, homes, and industries. Several of the most popular microcomputers will be available for students, supplementing major existing computer facilities at Stanford.

"Significant numbers of students will have access to a computer at home. Some industry spokesmen report 30,000 teachers now own microcomputers, and that number is expected to grow roughly 25% yearly," according to Profs. Robert Hess and Decker Walker.

"The result of this hardware revolution is an enormous demand for software that will enable users to learn from computer-based sources. Although program libraries are growing, software is needed that uses the enormous potential of the computer for the teaching of important subjects—language, mathematics, science, history and so on—at all levels of sophistication.

"The creation of this software is no easy or straightforward task. It is not the same as writing a book. Nor is it the same as writing a program for a non-educational application, such as bookkeeping or inventory control. It demands a knowledge of the machine, but also requires experience in designing and evaluating software for educational applications, and knowledge of psychology of learning, perception, motivation, and other human factors."

Programmers in the computer industry generally are in strong demand, with

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salaries for master's degree graduates starting at around $24,000 and increasing 15% annually. Educational software appears to be a growth sector within the industry, according to Hess and Walker.

Annual personal computer shipment facing dramatic upswing

Personal computers will continue to be among the fastest growing products in the computer industry, according to a recent study by Venture Development Corp., Wellesley, MA.

From just under 400,000 units in 1980, annual shipments will increase almost 2 million in 1985 for an effective annual growth of over 37%, says the report.

Priced under $10,000 and designed for a wide range of home and business applications, personal computers have evolved continually from the old hobby kits of the early 1970s. As the report explains, the home/hobbyist segment is substantially smaller now than when VDC first investigated the market four years ago.

The business user segment will be the fastest growing of the four end user segments examined. Shipments to this segment will increase by 52% annually, a growth rate fueled by new product introductions, and by aggressive promotion from manufacturers and dealers alike.

Shipments to the home/hobby category will grow by 26.2% annually, the lowest rate of any end user segment. The nationwide survey of personal computer users revealed that the home user is changing in many ways. The "electronics tinkerer" of past years has been largely replaced by the upscale professional with some knowledge of computers.

Shipments to the engineering/scientific segment will grow by 30% annually. The personal computers used by this user segment include the most expensive, high end desktop systems.

Shipments to the education segment, the smallest of the four in terms of total units, will grow by 34% annually. Personal computers used in education are typically designed for instructional purposes, although in smaller facilities, administration applications may also be run.

Information service introduced for electronics data

The first information-on-demand service devoted exclusively to the electronics industry has been launched by Venture Development Corp., Wellesley, MA. Based on the firm's data base of industry information gathered over the past ten years, Venturesearch is the first service of its kind to combine literature search and custom survey work to meet the requirements of electronics companies.

The service can answer requests for information on a wide range of topics, including market statistics, technology trends, financial performance, competitors in a specific market sector, product specifications, distribution channels, government regulations, marketing strategies, market forecasts and others. Coverage includes all sectors of the worldwide electronics industry: computers, industrial electronics, consumer electronics, communications, electronic components, semiconductors, instrumentation, medical electronics, office products, military electronics and electronic materials. Information is also available on end user industries for all product sectors.

Corporation offers incentive for students to utilize computers

An opportunity for elementary schools to earn TRS-80 computers was announced by the Radio Shack division of Tandy Corp. and QSP, Inc. The computers are earned by students as premiums from magazine subscription sales.

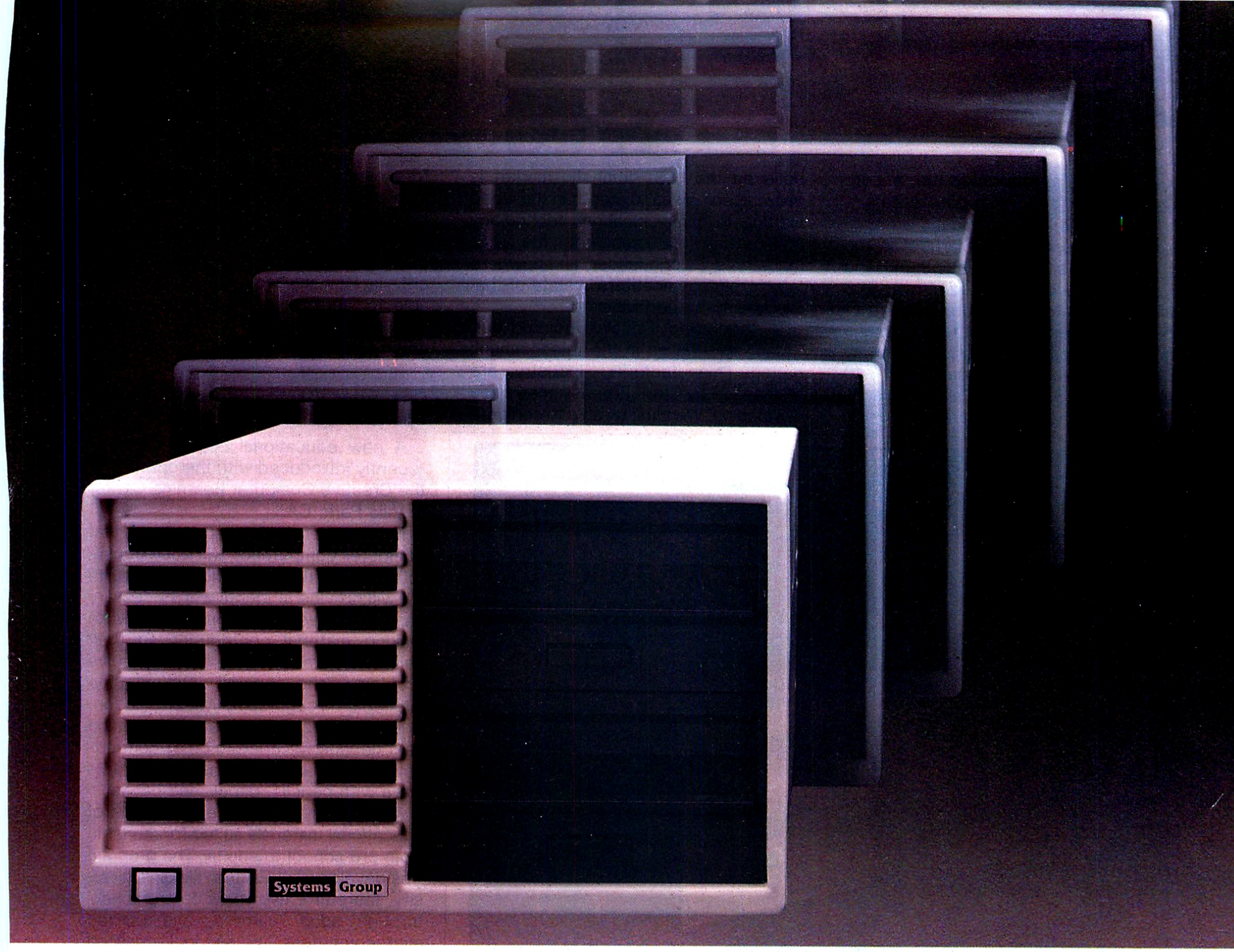
QSP is taking its established sales promotions a step further by offering the opportunity to bring computer literacy into the classroom. Charles A. Phillips, a senior vice president for Radio Shack, said that "QSP's innovative program should prove a boon to educators who find themselves budget constrained to bring the computer age to their classrooms and satisfy parent's demands for helping their children become computer literate."

Schools interested in the QSP program should contact William E. Drake, QSP, Inc., Box 2003, Ridgefield, CT 06877.

Foreign markets narrowing U.S. telecommunications lead

Closed foreign markets, along with growing importation into this country of foreign telecommunications equipment, threaten to erode the technological base and lead of U.S. manufacturers, according to John Sodolski, vice president of the Electronic Industries Association, Washington, D.C.

Testifying before the House Joint Economic Subcommittee on International Trade, Finance and Security Economics, Sodolski said, "If U.S. manufacturers are unable to maintain their domestic edge and lose market share to foreign competitors, it will be increasingly difficult to compete in the world marketplace." He added, "...there is evidence that the U.S. domestic marketplace has



enhanced XIOS. The CP/M based System 2800 provides improved diagnostic reporting capability and increased sector sizes of 1024 bytes yielding disk performance throughput increases up to 400% over standard unblocked systems.

The enhanced multi-user, multi-tasking MP/M based System 2800 provides the same advanced features as CP/M. In addition, this interrupt driven implementation can offer performance throughput increases up to 2000% thru extensive disk buffering for applications requiring a large number of disk accesses.

Also available is the OASIS operating system with ISAM files, automatic record locking and multiple-user print spooling.

All operating systems are available in either floppy or hard disk configurations. The disk drive selection includes single or double sided, double density 8-inch floppies with up to 2.52 megabytes of formatted storage per system, expandable to 5.04 megabytes, and an 8-inch 10 megabyte winchester hard disk.

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been specifically targeted for a concerted attack by foreign competitors."

"The U.S. telecommunications manufacturing industry is the largest in the world, with sales of equipment and systems in 1980 estimated at over $20 billion. Estimates anticipate the size of the U.S. domestic market telecommunications equipment should double by 1990, and sales should reach over $40 billion. The U.S. market is almost exactly one-half of the world market, and it's believed the U.S. domestic market is growing somewhat faster than the world market. In communications technology and quality of equipment, the U.S. industry is a world leader, and nowhere lags foreign competitors in state-of-the-art, quality, or performance."

In conclusion, Sodolski pointed out, "Many executives in the telecommunications manufacturing industry are dismayed by the trends they see developing. We must be able to compete freely and fairly not only in the U.S. but also abroad. Our industry is willing to meet all competitors anywhere, anytime, to win fair competition based on price, quality, reliability or any other objective criteria. However, to do that we must be able to meet our competitors on their own ground, and currently we are not able to do that."

Computer literacy center opens in California

A new educational opportunity was recently introduced with the opening of the Creative Computer Learning Center in Villa Park, CA.

It has been widely speculated that computer competency will soon constitute the fourth basic skill. The "Fourth R" will provide students with necessary basic knowledge of computers, while making material contribution to their ability to pursue logical thinking, solve problems, and generally expand their intellects through computer interaction. It is predicted that the students of the next decade will need to be as comfortable with the computer as their parents were with pencils, paper, and books.

The center will utilize a wide range of educational materials suited for students from pre-school to adults. The program was developed at Eastern Illinois University, tested for two years on pre-school through adult learners, and utilized microcomputers in an individualized learning program. Results of the tests included an increase in student learning motivation, the development of greater learning independence, the development of greater self-confidence, and an increase in the basic skills area.

French launch vidotex service in nationwide network

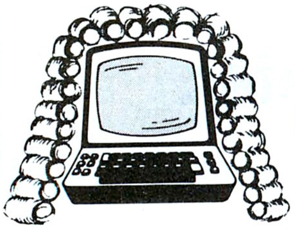
France's Poste, Telephone and Telecommunications Ministry (PTT) has launched the first massive test of a home videotex system, which will link 2,500 volunteer homes to a nationwide network of computer services.

Participants will be able to do banking and shopping from home, make hotel, air and train reservations, and have immediate access to a wealth of information, including timetables and stock quotations, the latest news and sports results, and up-to-date weather and traffic reports.

Among other features, the system holds the timetables for 1,500 French trains, in addition to listings of industries, tradesmen and organizations in 38,000 French cities, towns and villages, and a complete entertainment schedule for the entire country.

CIRCLE INQUIRY NO. 52

JURISPRUDENT COMPUTERIST



By Elliott MacLennan
Attorney at Law

Raising Business Capital

Seed capital is needed in every business. Computerfolk are no exception. Consider the following dilemma.

Firmware Fred, Inc. has a new product that he believes will successfully penetrate the OEM market, but he is cash poor. Sandy Software has conceptualized five new application packages that she believes will expedite the small business internal audit market. Although not cash poor, she cannot expend her efforts and consume machine time while trying to earn a living. Hardware Harry has developed a prototype Terrence Turnkey has given him a firm order of 2,500 units. Harry, unfortunately, does not have money to finance an inventory of raw materials.

Fred, Sandy and Harry all want seed capital without giving away control of their businesses to a venture capital group. My experience with computerfolk is that they uniformly believe that these goals are mutually exclusive. They believe financing new products without losing control is like trying to fit a round peg into a square hole. Not so!

In this and the next two columns, I will describe how to raise money for new products without sacrificing the control integrity of your company.

All three companies can benefit from a tax-sheltered limited partnership. The limited partnership permits the injection of seed capital without even interrupting company control. It's equally important that the limited partners do not become permanent "guests" in your company. You decide beforehand how long your guests shall remain.

A limited partnership is identical to what is commonly called a joint venture—with one important difference. Limited partnerships enjoy state law protection. Every state has a species of the Uniform Limited Partnership Act, which confers important tax shelter benefits.

In reality, there is no law for joint venture. When faced with a joint venture problem, courts usually look to the law of partnerships. A joint venture can take the form of a general or limited partnership. The general partnership has the advantage of management flexibility that the limited partnership lacks. In the general partnership, each partner has the right to participate in management. Any general partner can legally bind the entire partnership. This is flexibility and management diversification. It is a disadvantage that each partner is unlimitedly liable for the acts of each other partner. A silent partner is just as liable as a managing partner. That a silent partner is somehow shielded from liability is a myth.

A limited partnership has two classes: general and limited. You or your company are the general partner. You manage product development. A limited partner, by law, cannot participate in the day-to-day business affairs. Happily, limited partners do not desire to get involved. Their non-management position is their liability shield. They are liability-exposed only to the extent of their financial investment. Limited partners underwrite your company. You manage it.

The limited partnership is of French vintage, being imported first into the U.S. by New York in 1822. There are two reasons why the limited partnership as a capital raising vehicle for businesses has not been widely promoted. First, promoters are too busy with oil and gas, cattle, tank cars, film and video disk tax shelters to bother working closely with new technology products. Second, many businessmen fear any capital raising scheme as an attempt by venture capitalists to grab a permanent piece of the action.

After concluding a speech at the National Computer Conference four years ago, I was approached by a young businessman who bitterly informed me how he had pigeonholed a patented new product that took his wife and himself years of struggling to develop. He explained that although he had a commercially viable product, those from whom he sought financing wanted control of his company and severe restrictions imposed upon his salary. Two hours before sitting down to write this column, a client telephoned me with the same problem. This is the third or fourth time this month that it's happened.

Last month another client informed me that he had a firm sales order obtained at a trade show to sell his latest product. One of his distributors offered to loan him the needed inventory financing. The distributor's price was a security interest in the raw materials (reasonable) and 40% of the common stock (absurd). I've seen worse!

In a cattle tax shelter, money is first, management is second and the idea is third.

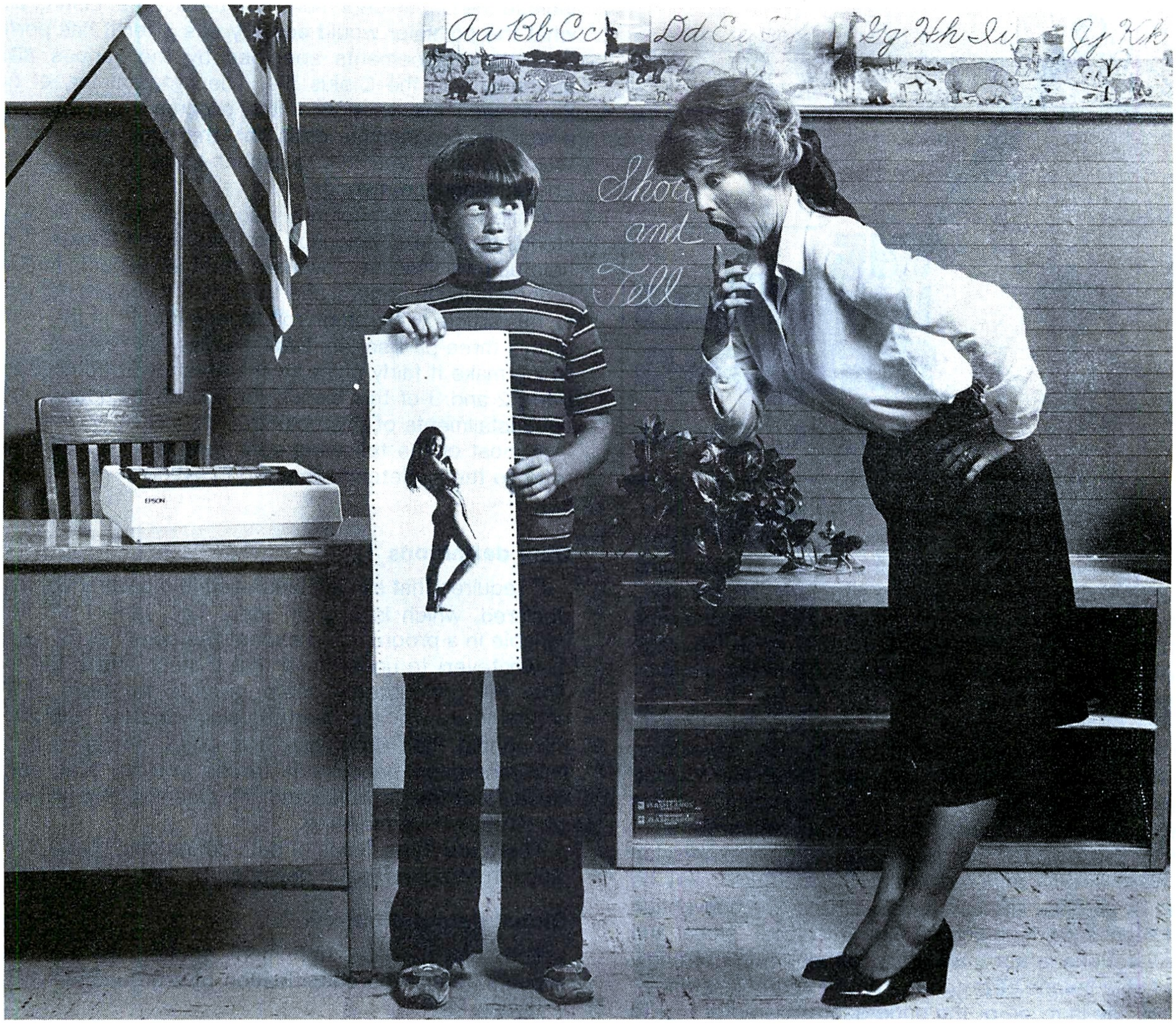
In every investment, three elements are present: the *idea*, the *management* to convert the idea into a market visibility, and the *money* to develop it. A simple but effective way to start the ball rolling to attract investor capital for new product development is to prioritize this investment.

In a cattle tax shelter, money is first, management is second and the idea is third. With oil and gas, management is first, money second, the idea last. In our world of hardware-software-firmware, the idea is first because it is innovative. Application expansion packages for popular computer hardware provide a new way for an investor to make profits. Oil and gas and cattle deals do not. Second is management, which develops the idea. Money comes last. You keep control, you manage new product development. The investor gets a share of the net profits of the new product.

Next month we will discuss how to package a new product. □

GAME CORNER

is now being authored by Patrick and Leah O'Connor. The column will resume in next month's issue.



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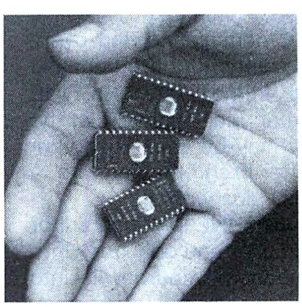

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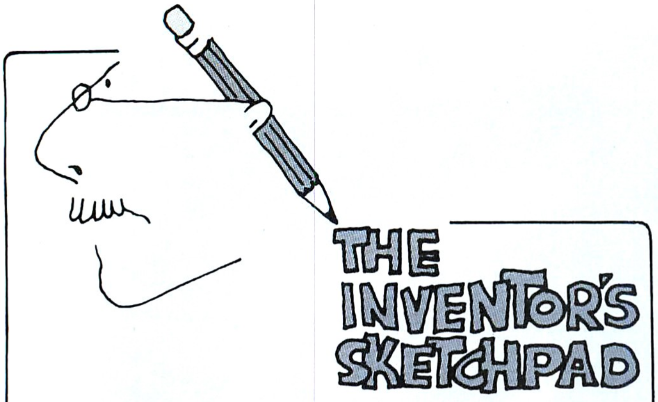

by Roger C. Garrett

Structured English for "C" Programmers

I have recently begun development work on a UNIX system that provided me with my first exposure to the C programming language. This language employs many structured programming concepts. It does not, however, provide a means of expressing those structures in an intuitively obvious, English language format; which is bad. I have attempted to resolve this situation with a method I call C.plus.

C.plus may be thought of as both an extension of the basic C language and a set of structures and guidelines for developing well-structured, easily readable, highly maintainable programs. Certain structures are imposed upon the programmer, others are available—but not mandatory. For example, whenever an IF statement is used, it must be followed by a logical expression and the word THEN, and the entire IF structure must be terminated by an END_IF. On the other hand, the convention of dividing the data definition section into local, global and reference sections is not mandatory, although it is strongly suggested as a means of program control and consistency.

Extensive use is made of the underscore character (_) to concatenate individual words into phrases. The phrase should be considered the basic token of the C.plus language. It defines both keyphrases (END_IF, OR_IF, EQUAL_TO, etc.) and variable names. It is strongly recommended that meaningful names be given (by the user) to variables, just as meaningful names have been given (via C.plus) to most keyphrases.

Listing 1 depicts the general structure of a C.plus program. The most obvious aspect of this listing is that it is quite wordy. Most programmers consider wordiness an undesirable attribute. I do not. I find that most programming languages that employ short cryptic abbreviations and mnemonics (and that includes most languages) are very difficult to understand, particularly if you are not completely fluent in the language. On the other hand, wordiness in itself is not an enviable goal. The language should allow the programmer to express himself in a natural way, conveying the intended meaning in the best manner possible. Comment statements are not sufficient to fulfill this need. The language itself should provide the facility. That is what I have attempted in my design of C.plus.

I was able to create C.plus because C provides a text replacement facility via the #DEFINE command. This is a command that effectively tells the C compiler to find every occurrence of a specified text string within the program and replace it with another specified string. The #DEFINE statements (and there may be many) appear, typically, at the beginning of the source file or they may be kept in another file and effectively included in the program file with a #INCLUDE command (which is how C.plus works).

It is important to understand that #DEFINE is *not* an editor command, it is a command to the compiler and only goes into effect when the compiler is translating the source file into object code. Listing 2 is a typical, very simple, C.plus program. Note the use of the #INCLUDE as the first statement to include the C.plus definitions into the source. Listing 3 shows what the compiler would actually see after it has performed the text replacements specified by the various #DEFINE statements in the C.plus file. The programmer, of course, never sees this version of the program; only the compiler does. The programmer sees only the original source file and thus can deal with it in a higher more intuitively obvious, English language manner.

While it is not absolutely necessary to have a full understanding of the C language to understand C.plus, it can be helpful. I will assume, however, that the reader is familiar with programming in general and trust that, if you are not yet using C, this article will prompt you to look into it. In the remainder of this three-part series, I will discuss the features of C.plus which make it fairly close to the ideal of Structured English. Parts 2 and 3 of this discussion will be included in the next two installments of this column.

In most of the following descriptions, it will be helpful to refer to the skeleton presented in listing 1.

Data definitions

C requires that all variables used in a program be explicitly declared, which is a great idea. You cannot simply use a variable in a program and expect the compiler (or interpreter or whatever) to understand that it must create the variable. This will undoubtedly seem strange to Basic or Fortran programmers who are used to using variables indiscriminately throughout their programs. It is good, however, to impose this restriction because it forces you to think about the *meaning* of the variables and the extent of the program over which they have meaning.

There are three types of data definitions: global, local, and global references, each delimited by specific phrases.

Global data definitions

The global data definition section is optional and appears before the specification of any function. It has the following form:

```
global_data_definitions
    ----
    ----
    GLOBAL DATA DEFINITIONS
    ----
    ----
end_global_data_definitions
```

The formats of the individual global data definitions are identical to the formats of local variables (which we will get to in a moment). The difference is that global variables are accessible from within *any* function, local variables are accessible *only* within the function in which they are defined.

Global data references

The global data references section is optional and appears as the first data specification within the data definition section. This section is used to specify which variables within a current function are actually references to global variables defined *outside* of the function. The general format of this section is as follows:

```
references_to_global_data
    ----
    ----
    GLOBAL DATA REFERENCE SPECIFICATIONS
    ----
    ----
end_references_to_global_data
```

Each global data reference specification has a format identical to the referenced global data, except that it is preceded by the keyphrase USE_THE_GLOBAL. For example, if there exists the following global data definition section:

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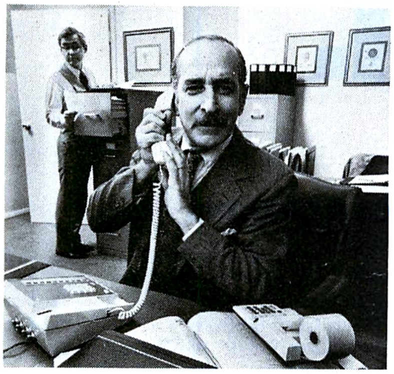

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```
global_data_definitions
  integer history;
  real vehicle_type;
  character pointer first_text;
end_global_data_definitions
```

then a function may refer to these global variables by including the following global data reference section within the body of the function definition, as follows:

```
the_following_defines_the display_information() function
  data_definitions
    references_to_global_data
      use_the_global integer history;
      use_the_global real vehicle_type;
      use_the_global character pointer first_text;
    end_references_to_global_data
  end_data_definitions
  ———
  ———
  REMAINDER OF FUNCTION DEFINITION
  ———
  ———
end_function_definition
```

Local data definitions

Data that are local to a function (i.e. can be referenced only by statements that appear *within* the function definition) are specified within the local data definition section. This section appears after the global reference section and is optional (if the function uses no local data). It has the following general format:

```
local_data_definitions
  ———
  ———
  LOCAL DATA DESCRIPTIONS
  ———
  ———
end_local_data_definitions
```

Each local data description consists of one or more type specifications followed by a name specification followed optionally by a subscription specification and/or an initialization specification and followed by a semicolon. I know that sounds complicated when you try to put it into English words. So the general format is:

TYPE NAME SUBSCRIPT INITIALIZATION ;

A type specification has the format:

MAJOR_TYPE SUB_TYPE

The subtype is optional, but the major_type is required. The valid major_types are:

character
integer
floating_point
real
double_precision

The floating_point and real types are identical and are comparable to normal (non-special) variables in Basic. Character types typically are 8-bit values capable of holding the characters of the system's character set and are comparable (to a certain extent) to string variables in Basic. They do not, however, require a special character following their name to indicate that they are character variables (e.g. A$). The data declaration alone specifies that it is a character type.

The only valid sub-type is:

pointer

which indicates that the variable is a pointer to a variable of the specified major-type. The default value of a pointer variable is <null>, meaning that it is not pointing at anything.

In addition, the integer type may be qualified by preceding it with one of the following:

short
long
unsigned

Listing 1. The skeleton of a C.plus program

```
#include "C.plus"
global_data_definitions
  ---
  ---
  DEFINITIONS OF ALL GLOBAL DATA
  ---
  ---
end_global_data_definitions
the_following_defines_the FUNCTION_NAME(FUNCTION_ARGUMENTS) function
  data_definitions
    references_to_global_variables
      ---
      ---
      GLOBAL VARIABLES REFERENCES
      ---
      ---
    end_references_to_global_variables
    local_data_definitions
      ---
      ---
      DEFINITIONS OF LOCAL DATA
      ---
      ---
    end_local_data_definitions
  end_data_definitions
  executeable_section
    ---
    ---
    EXECUTEABLE STATEMENTS FOR THE NAMED FUNCTION
    ---
    ---
  end_executeable_section
end_function_definition
```

Note the use of the ' #include "C.plus" ' statement at the beginning of the program. This invokes all of the C.plus conventions. Compiling of a C.plus program is identical to compiling of a regular C program.

Listing 2. A sample C.plus program

```
#include "C.plus"
the_following_defines_the main() function
/* of the leap_year program */
  data_definitions
    local_data_definitions
      integer input_year ;
    end_local_data_definitions
  end_data_definitions
  executeable_section
    printf("\n\n***** LEAP YEAR PROGRAM *****\n\n") ;
    printf("Enter a year and I will tell you ") ;
    printf("if it is a leap year.\n\n") ;
    printf("Enter a zero (0) to terminate the program.\n\n") ;
    loop
      printf("\nEnter the year : ") ;
      scanf("%d", the address_of the input_year) ;
      if (the input_year equals 0)
        then /* the use wants to stop, so */
        printf ("\n\nO.K. Bye.\n\n") ;
        exit_from_this_loop ;
      otherwise
        if ( ( the input_year modulo 4 equals 0 ) and_also
          ( the input_year modulo 100 is not_equal_to 0) )
          then
          printf("That is a leap year.") ;
        or_if ( the input_year modulo 400 equals 0 )
          then
          printf("That is a leap year.") ;
        otherwise
          printf("That is not a leap year.") ;
        end_if
      end_if
    end_loop
  end_executeable_section
end_function_definition
```

Listing 3. The preprocessed program of listing 2 (All C.plus statements have been translated, via the #include statements in the C.plus file into their corresponding valid C statements.)

```
main()
     int input_year ;
  {
   printf("\n\n***** LEAP YEAR PROGRAM *****\n\n") ;
   printf("Enter a year and I will tell you ") ;
   printf("if it is a leap year.\n\n") ;
   printf("Enter a zero (0) to terminate the program.\n\n") ;
   while(1) {
      printf("\nEnter the year : ") ;
      scanf("%d",  &  input_year) ;
      if ( input_year == 0)
         {
         printf ("\n\nO.K. Bye.\n\n") ;
         break ; ;
      } else {
         if ( (  input_year % 4 == 0 ) &&
            (  input_year % 100  != 0)) )
            {
            printf("That is a leap year.") ;
         } else if (  input_year % 400 == 0 )
            {
            printf("That is a leap year.") ;
         } else {
            printf("That is not a leap year.") ;
         }
      }
    }
  }
```

for example:

short integer maximum__size;
unsigned integer new__part;

A subscript__specification consists of one or more sets of matched square brackets enclosing the subscript ranges. For example:

integer room__contents[3][12];

indicates a doubly-subscripted array named room__contents, in which the first subscript ranges between 1 and 3 and the second subscript ranges between 1 and 12. Note that the lower limit of any subscript range is always 1. There may be any number of subscripts, each enclosed within square brackets.

The optional initialization portion of a data description consists of the keyphrase INITIALIZED__TO followed by a value. If the variable is character type, the value must be a single character enclosed within single quotation marks. Real or floating__point variables require real values, i.e. including a decimal point or in exponential format. Integer variables require integer values. Variables that are arrays (i.e. subscripted variables) may be initialized by specifying a set of variables enclosed within braces.

For example:

```
local__data__definitions
   real fred initialized__to 34.9;
   integer mary initialized__to 3;
   character john initialized__to 'j';
   integer krebs[3] initialized__to {43,56,2};
end__local__data__definitions
```

Structure definitions

In addition to simple variables and arrays, structures can also be specified within any of the data description sections. Structures provide the means to refer to groupings of variables and arrays. The format of a structure is first defined and then instances of that structure may be created. The following general format is used for defining the format of a structure (there may be any number of such structure formats within a program):

```
associate STRUCTURE__FORMAT__NAME with__the__
following__structure
  ———
  ———
  STRUCTURE ELEMENTS
  ———
  ———
end__structure__definition
```

Once a structure format has been defined, it may be allocated to a name (that is, an *instance* of the structure may be created and given a name by which it may be referenced) using the following general format:

```
allocate__the STRUCTURE__FORMAT__NAME
 structure__to
  ———
  ———
  ALLOCATION SPECIFICATIONS
  ———
  ———
end__allocation
```

For example, we can define a structure format as follows:

```
associate drivers__license with__the__following__structure
   character drivers__name[50];
   integer eye__sight__code;
   integer vehicle__type;
   integer restriction__code;
   integer date__of__birth;
end__structure__definition
```

which defines a structure consisting of several variables and associates the name 'drivers__license' with the structured format. Note that it associates it with the *format*, not with a variable or set of variables.

We can now create an instance of this structure with the following:

```
allocate__the drivers__license structure__to
   marys__drivers__license,
   johns__drivers__license,
   peters__drivers__license
end__allocation
```

which means that there now exists three 'variables' named marys__drivers__license, johns__drivers__license, and peters__drivers__license, each having the structural format of a drivers__license. This means that when the program refers to the variable 'marys__drivers__license' it is actually referring to the entire set of variables associated with that structure. (The fact that each instance name above happens to include the structure name is not significant. The instance names can be any valid name.) The program can refer to individual variables (elements) of a structure using the 'dot notation'. For example:

johns__drivers__license.restriction__code

refers to the restriction__code variables of the johns__drivers__license structure.

It is important to note that allocation of structures occurs *at compile time*. It is not possible to dynamically allocate structures during the running of the program, i.e. allocation statements may appear only in the data definition sections, not in the executable section. I find this an unfortunate restriction of C since it would be a quite powerful feature.

Also note that the individual elements within an allocate statement are separated by commas (,) and not semicolons (as is the case for most other statements).

The next two columns will cover the executable statements, control structures, and the C.plus file itself. □

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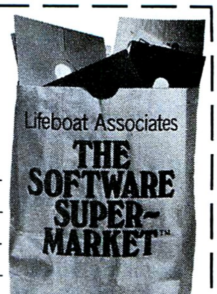

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THE MICRO-MATHEMATICIAN

by Dr. John C. Nash

Internal Functions

This month we take a brief glance at the internal functions supplied by the computer manufacturers or software writers. The discussion will focus on Basic, but can easily be applied to other languages that offer built-in functions of floating-point numbers.

A common misconception is that the elementary functions are somehow true to their name and therefore trivial to include in a compiler or interpreter. The reality is that they are very difficult to program reliably because their correct calculation is dependent on machine architecture, arithmetic, and range of arguments of interest. Furthermore, the programmer must adapt his function codes to produce error flags appropriate to the compiler or interpreter, so does not have the freedom to make comments or give warnings. Such warnings might be appropriate when the function argument is valid but is unlikely to arise in practice or where the approximation to the function desired has a higher than usual error bound.

The goal of the designer of a function library should be: for each valid set of arguments, return a value that approximates the desired function to the full precision available in the given computing environment.

Unfortunately, the goal of many software vendors is simply to include code, so that buyers can write programs incorporating elementary functions in expressions. There is often little concern to ensure that the user actually obtains correct values on each call to the function. The functions of interest are usually written in Basic as:

SGN(x) — the sign of x, returned as the value +1.0 if x is positive, −1.0 if x is negative, and 0.0 if x is zero.

ABS(x) — the absolute value or modulus of the argument x.

INT(x) — the most positive integer less than or equal to x.

SIN(x), COS(x), TAN(x) — the circular functions sine, cosine and tangent for argument x. (North Star, for one, lacks TAN.) The argument x must usually be given in radians, but some systems allow the user to control the unit of circular measure.

ATN(x) — the principal value of the inverse tangent of x, that is, the smallest angle whose tangent is x.

LOG(x) — the natural or Napierian logarithm of x.

EXP(x) — the exponential function of x, that is, Euler's number e raised to the power x.

SQR(x) — the square root of x.

y^x — y to the power x.

Some readers have probably noted that their system uses a different notation or has additional functions available. The Sharp/Radio Shack pocket computer uses LOG for base-10 logarithms and LN for base-e. It also allows ACS and ASN for Arccos and Arcsin functions and uses the symbol $\sqrt{}$ for square root. North Star Basic follows the Fortran convention SQRT(x). Various forms for the power function exist, notably the Fortran form y**x, with the double asterisk replacing the caret or "up-arrow" symbol.

The particular definitions of the functions may also prove annoying. For example, the signum function SGN returns the value zero for a zero argument. One might prefer that it returns +1.0 for all non-negative arguments in applications where one is looking for axis crossings.

Function programmers may misinterpret the INT function to imply the integer closest to zero. As defined above, INT(−3.0001) should return −4, not −3. Naturally ABS, INT and SGN are easily verified for such obvious exceptions. They may, however, be incorrectly programmed for very large or very small arguments.

In order to assess a given elementary function library, we should consider it in light of the goal presented above. There are two main aspects to investigate: acceptable limits for the function arguments; and the degree of approximation provided by the function programs for various arguments or argument ranges.

First, let us look at the limits for acceptable arguments on various functions. For ABS(x), it is clear that any representable number x whose negative −x is also representable should also be valid. The obvious mistake possible here is for the programmer to assume he merely has to change the sign bit in x. Many floating-point representation systems are not symmetric about zero, so the cases where x can be represented but −x cannot need to be trapped.

SGN(x) needs some attention near x = 0. If x is to be the result of an expression, one hopes that a normalized number is presented to the function code as its argument.

INT(x) clearly has a limited range, since integers cannot be represented exactly over so wide a range as floating-point numbers. After all, that is the purpose of floating-point. For example, suppose we have a system where 10 decimal digits can be represented. Then if X and Y are both 9999999999, the exact result of INT(X + Y) should be 19999999998 which cannot be exactly represented, the nearest representable number being 2.0E+10. This is the value returned by the Sharp/Radio Shack pocket computer. However, one wonders why an error message is not produced, since 2.0E+10 is larger than the true result. Alternatively, 1.999999999E+10 is the closest representable number less than INT(X + Y). My own preference is to limit the range to representable integers and flag all other conditions as errors.

SQR(x) can only accept non-negative arguments. Since

SQR(x) < x for x > 1 and SQR(x) > x for x < 1

we can always represent the square root of a non-negative number. However, the intermediate steps of algorithms for the square root may generate nonrepresentable numbers unless care is taken to avoid overflow and underflow. This usually means that the exponent is checked first. Suppose we want SQR(9.13E+99); this would be considered as SQR(91.3)* SQR(1E+98). The second root is simply 1E+49 by a division of the exponent by 2 (or a shift in binary machines). This reduces the range over which the square root algorithm must be accurate, thereby easing the headaches for the programmer.

Incidentally, in testing this on the pocket computer, I discovered a bug in the exponent handling in that all exponents are treated modulo 100. Thus 1E+901 = 1E+101 = 1E+1 = 10. No error message is given for these overly large exponents.

The power function y^x has two arguments, y and x. Though it is often treated as if it were an arithmetic operation, it is really a function. When programming, it is wise to think of it as "PWR(y,x)" to remember that there are two arguments. This function is much abused by users and is frequently poorly implemented in compilers and interpreters.

The abuses of the power function often involve its application to raising numbers to simple powers. This requires the computer to approximate the function rather than perform a

simple multiplication. Besides taking more time, this may produce unnecessary error in the result. For example, the pocket computer gives the following results if we set

```
Z = 996671.488
  R = Z*Z = 9.93354055E+11
  S = Z^2 = 9.933540548E+11
  Difference: R - S = 200
  Difference: Z*Z - Z^2 = 161 (there are guard digits in
                               this calculation)
  T = EXP(2 * LN(Z)) = 9.933540548E+11
```

Some implementations of the power function actually use this last form with log and exponential functions. That this is not the case for the pocket computer is shown for X = 5.6789 and Y = 1.23456 where

Y ^ X − EXP(X * LN(Y)) = 3.E − 11.

Similarly, one should avoid forming the square root by raising a number to the power 0.5. For this case, where the equivalence to the square root is presumed, it is obvious that the argument y (the number to be raised to a power) must be non-negative, yet in the case of (− 1)^2, we would expect a result of 1. In fact, the pocket computer gives an error message whenever the first argument of the power function is negative. The North Star allows integer powers of negative numbers. Clearly, the interpreter writers for the pocket computer have wished to avoid any problems with powers of negative numbers. This restriction is not unreasonable. However, they have let through the awkward case of 0^0, though the function cannot be defined for these arguments, and return a value of 0.0 for the function. The following results are also observed.

```
1E-99 ^ 1E-99 returns 1.0
1E-99 ^ 0     returns 1.0
    0 ^ 1E-99 returns 0.0
```

It is clear that the function has a discontinuity near (0,0) in the arguments, which normally should be considered as invalid input to the power function program.

Different considerations motivate the limits on the range of arguments for the SIN and COS functions. Mathematically, these are cyclic functions with a period of 2 π radians or 360° so that any argument is supposedly acceptable. However, we can use the periodicity via the identity

$$\mathrm{SIN}(x) = \mathrm{SIN}(x - 2\pi)$$

to reduce the argument so that it lies within a convenient range for calculation of the function by some approximating method. For instance, we may want x to be between $-\pi$ and π ($-180°$ and $180°$). However, if x is very large, this range reduction cannot be performed with sufficient precision to allow the function to be reliably calculated. Consider the argument x = 355, which is only slightly greater than $113*\pi$, having the approximate value 354.9999699. The unavoidable digit cancellation, if we can perform the range reduction in one operation, means that the argument used to compute the function value has few digits of useful information, and the result should therefore be expected to have similarly low relative precision. The absolute error may nevertheless be acceptably small. If the range reduction is carried out in small steps, we will suffer the rounding errors that occur when a small number is subtracted from a large one.

Unfortunately, the range reduction for functions is frequently poorly coded. I have observed cases where the argument is near a simple multiple of π, in which the values returned for trigonometric functions have been totally spurious. One can test for such conditions. The arguments will be near some value $x = m\pi/2$ for m an integer. By multiplying x by the machine precision (Micro Mathematician, IA May 81), a quantity q is obtained that should alter the last digit of x on addition. The trigonometric function is then listed for every

argument x + j q, for j = −10, −9, ..., −1, 0, 1, 2, ..., 10. The listed values can then be checked for incorrect performance of the function generator, which is usually in such cases related to improper range reduction.

Very large arguments for trigonometric functions are evidently absurd, offering little more than a method of obtaining random digits, yet several common microcomputers allow huge values as arguments. The user can, of course, determine the limits to the range of arguments allowed for a particular function by altering the argument until an error occurs. If the system allows errors to be trapped under program control, this process can be automated. The North Star Horizon (release 4 software for Floating Point Basic) revealed the following approximate bounds

Function	Largest argument or smallest argument for which no error observed
SIN	205885.84
COS	205884.27
LOG	3.98E − 64
EXP	145.062

Let us now suppose that the compiler or interpreter has correctly accepted valid arguments for a function of interest. Then we wish to know if it produces a correct value for that function. After all, such results are the raw material of technical calculations in engineering, science, finance or navigation. There are two main types of tests: comparisons with known results; and internal verifications based on functional identities.

The first form of test is the best, but is extremely difficult and costly to perform systematically over a sufficiently wide set of argument values, particularly if we are to discover one or two spurious results that may exist somewhere in the spectrum of allowed floating-point numbers. (Tests should also ensure correct error trapping, as above.) The entry of huge tables of multi-digit numbers is tedious and error prone.

The alternative of implementing a new and well-documented function generator in a precision higher than that of the function to be tested is rarely practical.

However, in the Signum Newsletter, volume 16, number 1, March 1981 (published by the Association for Computing Machinery, New York, NY), Dr. Ed Battiste describes such tests for the functions provided with Basic and Fortran for the Radio Shack TRS-80 model II. The verdict of his study is that the elementary function codes left much to be desired. However, his overall satisfaction with the system for carrying out mathematical computations was greater than that with the functions alone.

Internal tests based on functional identities are easier to perform. For example, we could calculate

SIN(X + Y) − SIN(X) * COS(Y) − COS(X) * SIN(Y)

over a set of X and Y values and look for relatively large non-zero results, which would imply some sort of failure of the function generators. Unfortunately, this only tests certain

User pressure will have its place in providing motivation for better codes and documentation.

aspects of the function routines. A systematized, comprehensive battery of identity tests that operate in a single precision environment would be a great aid to users. At the moment, it seems unlikely that such a group of tests will be developed in the near future.

Where does this leave the concerned user? Truthfully, he is without assurances that his programs will calculate correct results even if his own code is perfect, since the elementary functions he calls may be in error. This could be inexpensively corrected by the manufacturers and software vendors, since the expertise to produce good function codes exists, though it might mean outside contracts for companies accustomed to doing all their work in-house. User pressure will have its place in providing the motivation for better codes and better documentation of the methods used. Lack of demonstrated concern will result in inaction and faulty calculations—calculations that may be used to design vehicles, navigate airplanes, or compute your mortgage.

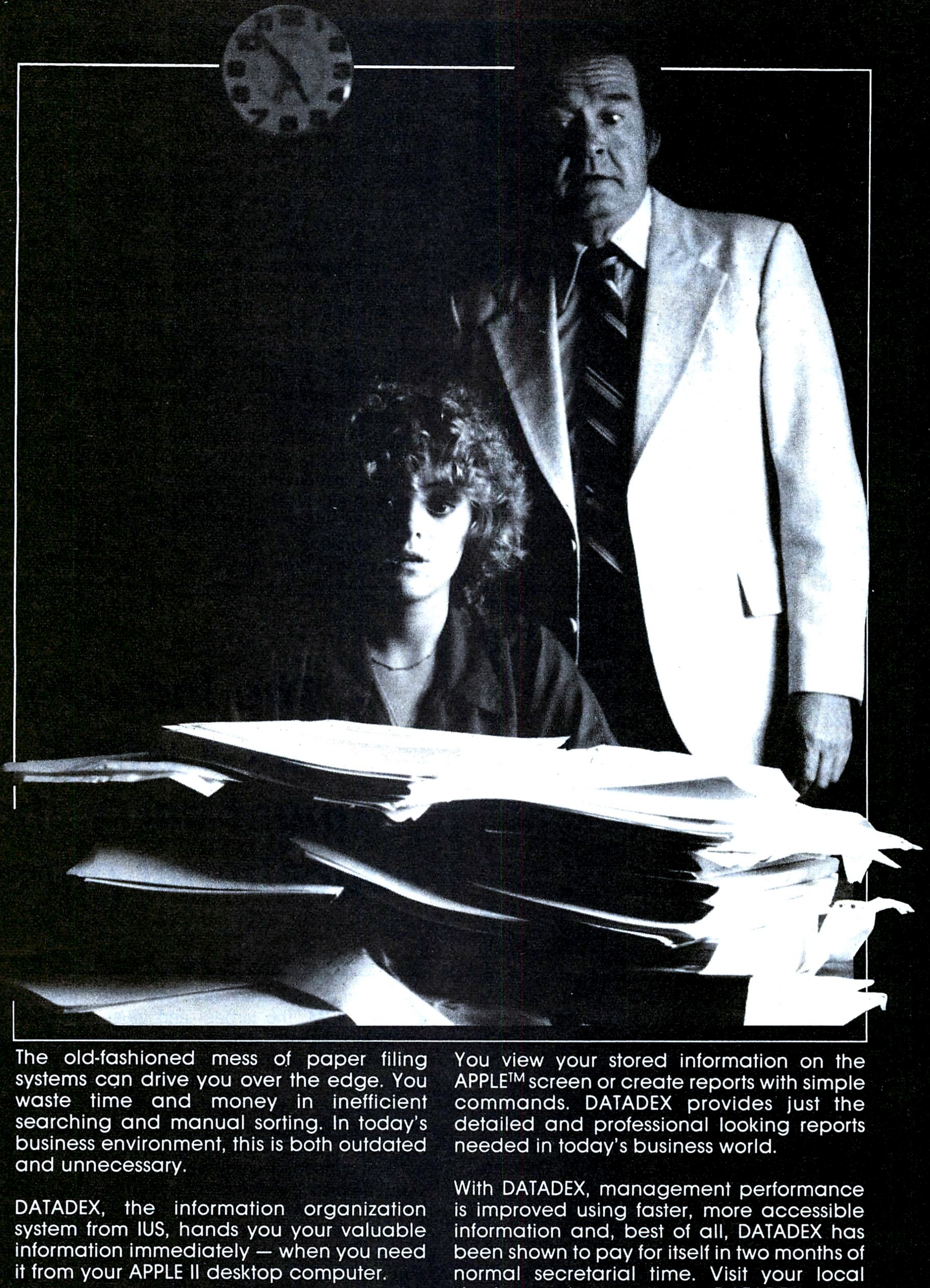
Some measures that users can take to control their own calculations are:

- Determine the argument ranges of functions. If they are unreasonably large, build your own error trap with simple IF statements.
- Compare selected results with tables such as those in M. Abramowitz and I. Stegun's *Handbook of Mathematical Functions*, Dover, NY. Comparisons should concentrate on regions of interest to the user in his applications.
- Test the function using identities similar to forms that must hold for the application at hand. For example, multiple angle formulae may be important to periodic phenomena; small argument results may be crucial to perturbation calculations. Such checks can also be built into the program to detect function generator failure. Abramowitz and Stegun is a good source for many of these relationships.
- Prepare special function code in Basic for cases that are of a specific nature. For instance, the power function is a poor choice for computing interest factors over fractional periods. We need to find

$$(1 + r)^p - 1$$

for p a fraction such as 1/6. The binomial theorem permits one to compute an accurate result for this function very easily in this range of the arguments. □

The Evan's Report Is In There—Somewhere!



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Learning with Micros

by Louis E. Frenzel

Using Education to Sell Microcomputers

The microcomputer business has always been very competitive. A number of manufacturers recognized early that there was money to be made selling micros. Even in the mid-70s when the personal computer phenomenon began, there were many companies battling for the largest share of the hobbyist market. Today manufacturers are slugging it out for a piece of the lucrative small business, professional and educational microcomputer markets. Special strategies are often required to be successful in such a competitive environment. One of the strategies that shows promise of working is education.

There are a lot of people who are prospective microcomputer purchasers. As the most obvious segments of the field become well penetrated, increased sales will only come by educating more people about the benefits and applications of computers. There are so many uses for the general purpose microcomputer that the applications are often not obvious. Many potential customers do not realize that a microcomputer may be the solution to their problem or an alternative to other approaches. Once people know what they can do with a microcomputer, they may be more inclined to buy one.

Another motivation for educating potential customers is to help them overcome the fear of computers or their lack of confidence in being able to use them. A sales prospect may realize the potential, yet be hung up with anxieties and afraid to act because of his lack of knowledge. Education can certainly help overcome this. Knowledge erases the doubts and fears. Educating the general public is the key step in creating a broad new base of potential microcomputer customers.

People who already own or use microcomputers are also candidates for education. These people have already made the investment and have learned how to use the machines. However, there are probably many additional ways that they can obtain further use and value from their purchases. They can be taught new and better ways to use their computers. They can be introduced to new software, operating systems, languages and programming skills. Educating existing owners can stimulate additional interest in new applications, which can lead to further sales of more memory, new mass storage devices, peripheral equipment and software. What microcomputer owner isn't continually looking for a new and better way to use his computer?

In order to sell microcomputers effectively, the people who meet the customer need to know as much as possible about their products and the potential applications. One of the main principles of effective selling is "know your product." The computer store salesman can only sell effectively if he is totally familiar with the hardware, software and the potential product applications. In addition, these people also need to know the basic rules of selling. Education can readily provide the technical background required as well as impart the necessary selling skills. With product and sales knowledge, distributors and dealers can effectively sell more computers.

Given that education is a good thing in all these cases, who should do it? The manufacturer is the most likely source. As experts on their own products, manufacturers should be the ones to provide the training in hardware and software, sales and service. Manufacturers also have the resources to educate the general public. Through ads, articles and other means, the manufacturer could make microcomputers more widely known and understood.

Responsibility for the education of the present owners and users may also be that of the manufacturer. If the manufacturer wants to retain customers and keep them happy so that they will continue to come back for additional peripherals, software, and other accessories, education can do the job.

The distributors and computer store people can also do some of the education. Since they will directly benefit from the new sales that education can produce, there is no reason why they should not invest in the training of customers. In many cases, the dealers can do a better and more direct job at education than the manufacturer. For example, a lot of dealers already sponsor classes and seminars in the store to generate interest and sales. They also sell relevant books, magazines and self study courses to support the hardware.

Finally, the book and magazine publishers can serve a useful purpose in educating the general public about computers. There is significant opportunity in creating a broad general computer awareness and literacy among the population.

If education is such a good strategy for selling and supporting micros, why is no one using it? The fact is, some are using it but they are not micro manufacturers. For example, IBM, the largest and most well known computer company, did not achieve its status by having the lowest prices and the hardware with the most sophisticated technical design and best performance. When you purchase an IBM computer, you purchase a modest piece of equipment for a relatively high price. What you are buying is reliability and reputation. You are also buying a solution to your problem, not just a piece of hardware. And customers know that they won't be disappointed because of the education and support backup. IBM provides a broad range of customer educational products and services. The company knows that by educating a customer, they are also creating a satisfied customer. And they do not give away their education. Virtually all IBM customer training is sold separately. The backup and support is also an important part of the strategy. Nowadays, a computer company that does not provide the customer handholding and back-up will not survive long. Most of the big minicomputer companies, like DEC and Data General, have also recognized and adopted this approach. It's hard to argue with success.

The industry as a whole must carry the educational process.

Who will be the first microcomputer company to adopt policies and procedures including education and support? Maybe it will be IBM or DEC. □

Unique accessories to PET/CBM add more power

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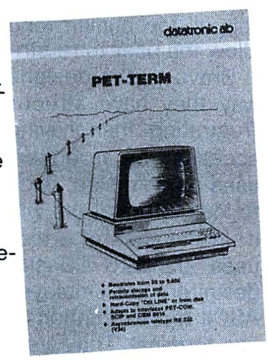
Price:

PET-FORTH, including manual	**$ 390**
PET-FORTH, only manual	**$ 40**
Target compiler **PET-FORTH**	**$ 1000**

PET-TERM



A program that turns your PET/CBM 8032 into an intelligent terminal. Supports three different interfaces: the PET-COM, the SCIP or the CBM 8010 acoustic coupler. You may communicate at up to 9600 baud, with selectable framing and parity. PET-TERM will also translate and transmit Word-Pro files. Data may be printed on the printer or saved on disk PET-TERM includes a lifetime guarantee.

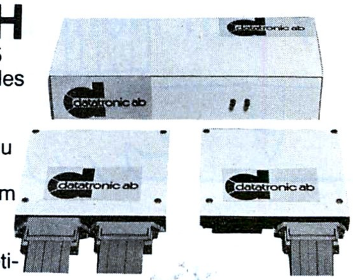
Price:

PET-TERM, including manual	**$ 180**
PET-TERM, only manual	**$ 20**

Dealers are invited.

Hardware

PET-SWITCH



At a sensational price of £ 75 per unit, PET-SWITCH enables you to connect up to 16 PET/CBM computers to one disk drive and one printer. You can mix all models of PET/CBM in the same system (2001, 3032, 8032 etc). PET-SWITCH is technically superior to most of its competitors–no priority problems for example.

Price:

PET-SWITCH, mother unit	**$ 250**
PET-SWITCH, daughter unit	**$ 150**

SCIP

A Serial Communication Interface that supplies both RS-232 and Current Loop. Programmable baudrate. Adressed as an IEEE device. 50 character internal buffer. Selectable ASCII translation.

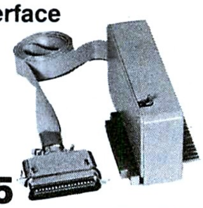
Price: **$ 480**

PET-COM – RS-232C interface for PET

A bidirectional RS-232C interface that connects to PET via the memory expansion port. The baud rates range from 50 to 9600, and the number of data bits and stop bits is selectable. You may also set even, odd, or no parity.

Price: **$ 145**

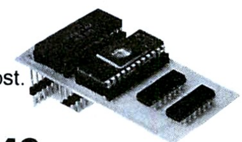
PET IEEE to Centronics Interface



This IEEE => Centronics interface is especially constructed for the PET. It is fully addressable and translates from PET-ASCII to Standard ASCII in two different modes, corresponding to PET's graphic and upper/lower case modes. This is available through a built-in switch.

Price: **$ 95**

Country specific Character Generator for the 4022 and 3022 printers



By using this board you can have Greek, French, German, or any other special characters in your printer, at a very low cost. It is already used in all Nordic countries, and several other countries have requested it.

Price: **$ 40**

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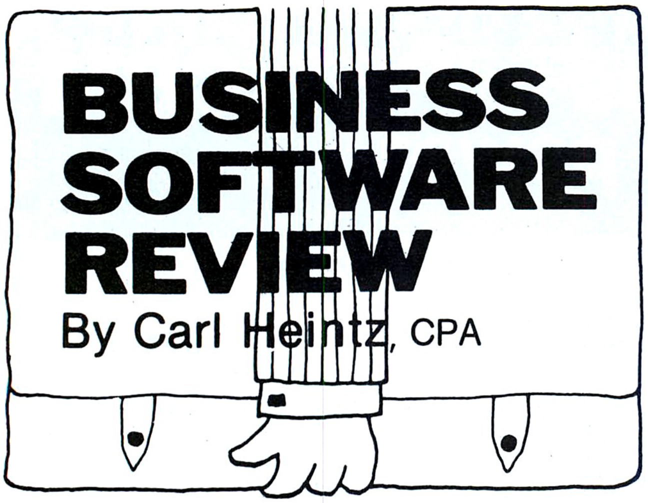


Selector IV Revisited

Several years ago, this column featured Selector IV, a data base management system and "application generator" offered by Micro-Ap, Dublin, CA. Since it has been a while and software is an evolutionary art, we direct our attention to the new Selector IV product.

A word of caution: the price of power is complexity. Selector is by no means a simple program. Those who are not willing to spend a few days learning how to use this tool will be better off with a much less complex but easier to use program, such as TIM or DBMS. If you want the best possible performance out of your micro, consider Selector.

Selector has an entirely different feel to it from much computer software. It has an undefinable but distinguishably different approach towards data base management, which becomes apparent when the program is initially set up. Take, for example, the extensive use of set-up forms that accompany the manual and are intended to increase the speed and accuracy of the implementation. It is rare to see that sort of thing with micro software.

The first change I noticed from the first time I met Selector was the manual. It has been greatly enlarged, worked over and re-organized. Written in clear, concise prose, it is designed for a non-computer-type. That was one of my major cautions about Selector in the previous review. One of Selector IV's major strengths is in the documentation. It is outstanding, but still complex.

Selector is used as an applications generator. It combines the features of both a data base management package and a higher level language. The programs themselves are long (over 500K worth of programs) and divided into two categories —definition and execution.

The definition portion is used to generate a number of disk files that govern the later use of execution of the Selector application. In other words, first you define what you are going to have the computer do, then the computer and operator do it.

What you end up with, then, is an application program that has been generated by Selector and the operator, which can be used with some of the core programs included with Selector. Unlike Pearl, in which a produced program is independent of the generator, the Selector link is always present. On the other hand, the hooks and techniques are included to allow the production of an applications program that appears to the operator to be a totally unique application. This is unlike TIM, for example, in which there is always reference to the TIM programs. Without re-writing the code, an operator always retains full latitude and control over the system as a data base manager.

The system is highly dependent upon prompted menus, fully utilizing the terminal's cursor addressing capabilities. It will run on just about any computer with an 80 column by (at least) 24 line CRT. Included on the distribution disk are pre-set-up terminal instructions for 17 common types of terminals, plus you can write your own if necessary.

The system needs a CP/M machine with CBasic-2. The more memory the better, but at least 32K are required to produce any meaningful programs. The system will run on just about any micro, including the Apple with CP/M softcard. TRS-80 users cannot use the system on the models I or III, though it runs very well on model II with any one of several versions of CP/M available on that machine.

The file definition section is used to name the fields, give their type and designate them as duplicate of unique key fields. Up to 80 fields can be defined for the records of a file. The operator can designate data as numeric, alphanumeric or date, and the combination of all the fields in each record can have up to 257 characters. A field name can be up to 12 numbers/letters/characters long. Additionally, a field can be defined as a key field, which means that it will be used to locate the record according to the contents of that field. Up to 80 key fields can be used, which means that it is conceivable that every record in the file could be accessed from any field, with no key as a preferred or primary status. There may be multiple unique keys in the same record. Each key corresponds to a subfile of the key file, which are searched by a simple binary search. This allows the user to reorganize the data file in any order if this is beneficial for some application.

Selector allows the user to specify how many digits are allowed to the right of the decimal point—any excess entered or computed will be truncated. This is useful in the case of computed financial information. The way data base management systems store dates is generally set in concrete by the programmers. Selector allows for MM/DD/YY or YY/MM/DD and if desired, a four digit year can be used (i.e. 1980).

The final definition in designing a file is the sequence number of the field. That is a method of insuring that the fields to be changed most will be entered first. Once a file is defined, it is not uncommon for a user to determine that the most critical element has been omitted. Selector allows for this all too human tendency with a series of programs that allow the user to re-structure the way the files are organized.

Bravo to the designers of Selector when it comes to the way they have structured the files. Nothing can be more frustrating than having to deal with files that cannot be accessed by an editor. Take for example any program that uses random files, packed binary format. There's just no way to look into that file without a program to specifically access it. In the case of a foul-up, the user is out of luck. Selector uses standard CBasic-2 files, with the exception that no delimiters are employed between fields. All fields are thus in ASCII representation and can be visible to display on printer and terminal. They are subject to manipulation by any number of sorts, editors or even word processing programs.

The heart of any good data base management system is the capability it has to select records from files. Selector is a good implementation of a Boolean selection system (AND , OR , < , > , <> ,). Both string and numeric comparisons are possible. Strings can be checked for "contains" and "not contains." They can be used in connection with sorts.

There are two facilities that can be used to reorganize or rebuild the file. The rebuild function essentially allows the user to rebuild the file definition. The restructuring function actually allows the user to restructure the data base. Information can selectively output fields to new files, or take data from within a file, perform mathematical or logical tests on it and put it back into the file. It's even possible to invoke a series of steps dependent upon the result of one or more operations to process the data. These procedural steps can be invoked on records from up to six different files at once. The program can compare field values with those in the last record read, and it can delete, modify and skip records.

The batch updates mode allows the system to read a source file, such as a transaction file, directly in its physical order, or by means of some select or sort pointer list. As the

file is processed, it can be used to delete records, modify records, or arithmetically process any numerical field by any other numerical field or numerical constant. The practical use of this is powerful: for example, in one application, the quantity in a transaction price could be multiplied against the stock price of an inventory file and the results updated in an accounts receivable file and a journal file.

Selector comes with two report generators. Reports can be prepared in as columnar reports or as full-page custom laid-out formats. Reports may be printed in any sorted order, or from the entire data file, or from any subset of the records. The form length, number of lines per page and page width are definable. Either continuous forms or individual sheets can be used.

The heart of a good DBMS is the capability to select records from files.

The Columnar report generator can be used to generate the standard accounting-type of columnar report, or can be used to prepare mailing labels or continuous form envelopes. The user specifies the order of the fields, which can be actual or derived and will be included in the report. Summaries can be placed at the bottom of the page as subtotals or totals.

The second report generator is extremely valuable for custom generated reports. The user can specify the exact row and column for each piece of information, the lines per logical record, the margin at the top of each sheet, the lines between logical records and the columns per page. The flexibility of this system rivals that of FMS-80, previously reviewed in this column.

Selector IV has a data entry sequence that is fast and convenient. It is quite similar to that used by TIM in that it specifies the field number, the name of the field, then indicates the number of characters or digits that may be entered in a field (TIM uses ".", Selector uses "-"). Unlike Condor's DBMS, there are no provisions for custom designing an input screen.

There are a number of other products on the market that are similar to Selector. In some cases, as with TIM and Condor, the familiarization process is much simpler. TIM, for example, can be given to almost a rank beginner. The producers of Selector attempted to do the same thing with their expanded manual. However, the complexity of the system will be too much for a first time user to quickly comprehend. TIM is not as complex a program as Selector, though they do share some similiarities. The input sequence is very much the same, but the editing features of Selector are a bit easier to use (although TIM is quite good). Selector does allow the user to re-arrange the sequence of input to be different than the file layout enabling a user to put field 5 in before field 1, for example. FMS-80 and Condor have even better cycles, though.

Selector has some provisions for reading files produced by other programs and converting them into Selector file format (for C Basic and M Basic files). Condor's system is more comprehensive at this writing, allowing not only reading of files but also writing to other file formats.

Selector's reporting capabilities are as good as either Condor's or FMS-80's, especially in the area of custom reports. The definitions are as easy to work with as FMS-80, and all the "hooks" are present to produce very acceptable reports. Condor's output features are more difficult to use for custom reports, since the user must be crafty about designing the reports so the file name doesn't print out. FMS-80 uses almost the same scheme as Selector.

The logical operators and math functions used by Selector at first appear much more complex than either Condor or

Main/Frames from $200

FMS-80. However, there's really not much difference once you begin to use the system. The comparison to learning a foreign language is a good analogy.

The Selector manual does not contain a start-up section with simple examples for all the new users to practice with, like TIM and Condor DBMS. As a result, it's a little tougher to wade through because one must be exposed to most of the complexities before beginning to use the system. However, the manual is well-written enough that this shouldn't be a problem.

Selector does not contain a flow chart of the system. Neither does any other DBMS I've reviewed to date. A simple organization chart would do wonders for the novice users' understanding. Overall, Selector is an unusually powerful and versatile system.

Glector IV is a general ledger system utilizing the Selector IV system. It is designed for use by small businesses and professional people. To say the least, the system is unique.

Glector uses a novel method of entering information into the computer. Instead of the normal journal entry sequence that all accountants are familiar with, Glector updates the general ledger accounts according to the type of transaction being entered. In other words, the operator enters a transaction code, which in turn triggers the debitting and crediting of the appropriate accounts. Of course, the transaction codes must be entered in advance into what is known as a Chart of Transactions.

Avoid the pitfalls

The usefulness of this approach is demonstrable for employees who know nothing about accounting but have a good common-sense grasp on the workings of the business. As long as the accounting system is relatively simple and the types of transactions easily classified into a few common reoccurring types, the scheme works acceptably.

However in a company with, say 50 different expense categories for two departments, there has to be 100 transaction codes to handle the disbursements. One wonders whether or not it isn't just simpler to teach the employee how to code the disbursements in the old-fashioned manner.

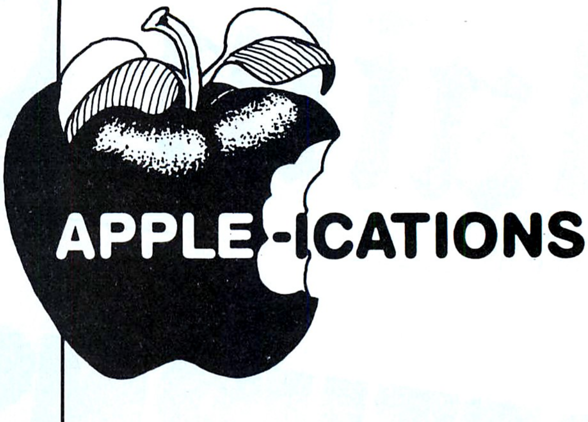
Glector has the capability of maintaining comparative balance information from one year to another. This allows a nice comparative balance sheet, although the format of the balance sheet is less than entirely satisfactory because the account numbers are printed and there is no provision for rounding off pennies. Additionally, there are no provisions for underlining or dollar signs.

The system does provide an automated statement of changes in financial position which, given the limitations placed by the method by which it is derived, is fairly well presented. To be fully in conformity with generally accepted accounting principles, however, the statement will have to be modified in most cases manually.

The detail general ledger produced is readable and complete. It includes a detail by account number of the month's transactions. However, the subtotals include only the activity for the month; the beginning and ending balances are not shown; presumably the balance sheet is used for that. The system does provide for the production of a transaction run—something mandatory for good accounting control.

The manual is designed for someone who has familiarity with the Selector system. Accordingly, Glector should not be of interest to anyone who has no intention of learning to use Selector. There is no operator's manual per se, nor does the manual contain information about the specific file structures, since the Selector system is used.

If you don't like the approach Glector has taken in the entry of data, why not change it? The advantage of changing Glector over trying to modify another commercially available program is that you have a decent chance of succeeding, assuming that the information in the manual is read, comprehended and applied. The two areas that need addressing are the data entry sequence and the report presentation. □



by Dirk van Nouhuys

The Micro and the Professional Writer

In a garden cottage in Redwood City, CA, a lean man who gives the impression of being of almost one color—tanned, dark blond hair, khaki slacks, brown shirt—scrutinizes yellow writing on a green screen mounted between high book shelves. He taps away at a keyboard some distance below the screen.

The man is Rob Swigart, author of *A.K.A, The Time Trip*, and other science fiction novels. His current novel, *Losing Face*, is being composed on an Apple II computer.

The proliferation of text editors on microcomputers is bringing machine support of writing beyond large organizations. Freelance writers are increasingly apparent among the new users. Previously, writers who have been using micro editors have mostly been people associated with computers or related technology, with the special advantages and demands of customers oriented toward technical publications. Swigart is one of a growing number of fiction writers beginning to work with micros.

Swigart acquired his low-numbered machine for a computer research project before a word processing program existed for the Apple. In fact, when he decided he wanted to explore word processing for his fiction, he rented a Rothenberg machine for the month. This convinced him of the value of word processing but the Rothenberg machine was too expensive for his needs.

When I commented on the fan and the holes drilled in the case of his Apple, Swigart explained that he has had every possible card in the machine and had broken it several times. Now he has taken everything out but an 80-column board and a disk controller.

The word processor program he uses is Easy Writer. He has compared it to the other word processing systems, and sticks with it because he likes the quick read from the disk and the good support. He has remained in touch with the developers of the program; they have discussed new features with him and supplied new test versions.

Some writers, particularly those who have use of large processors and large-scale file systems, think of the online form of the book, the magnetic record, as the "manuscript." For Rob, on the other hand, the typed page remains the reality. His normal cycle of work is to copy edits from paper to the online file at the beginning of the day, then turn to typing in first draft material. At the end of the day, he will print out the first draft and edit it in pencil. "I find myself hurrying to get that printout," he says.

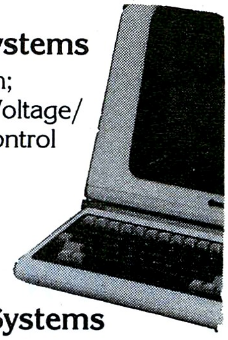
Swigart prints on an old Diablo 1620 he picked up at a fire sale. At the time, it was the cheapest printer he could find that could make pages acceptable to a publisher. But it is more quality than he really needs. If he were buying now, he says he would buy one of the more presentable dot matrix printers selling between $700-1,000.

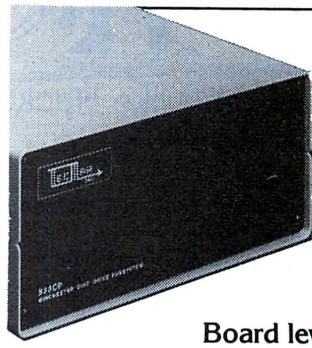
One reason Rob works the way he does is that he is a good typist, comfortable with a keyboard. A Selectric typewriter stands beside his Apple. He prefers the Selectric for short business letters: "By the time you've started the Apple, and loaded the diskette and called up a file, I'd just rather type it." His work does not require the repetitive letters that are the bread and butter of many word processors. For this reason, he likes features that make the system resemble a typewriter.

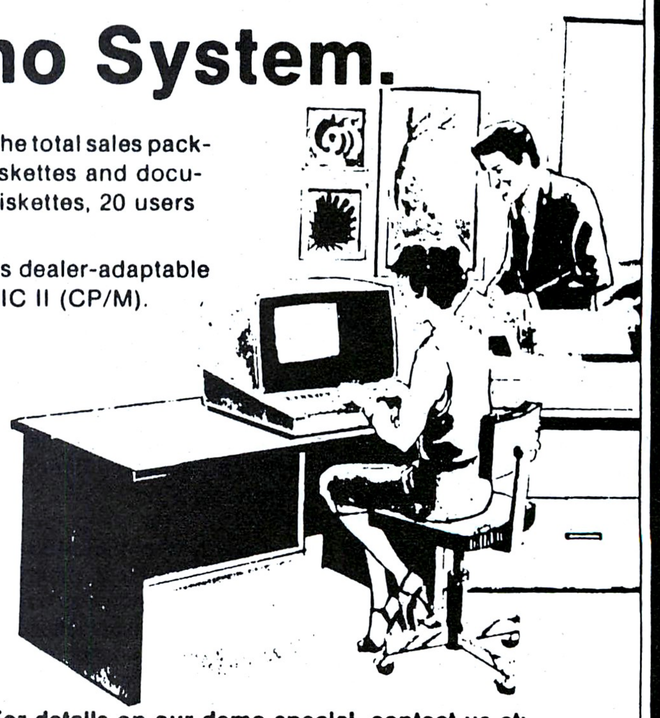
He finds two main advantages in using a word processor—faster and cleaner drafts. The first two weeks he had the word processor, he did two short chapters. "I was playing around," he says. He did 200 pages the following two weeks (before his month rental was up). Since settling down with his Apple, he has slowed down from that rapid production, but still figures he can produce drafts about twice as fast as he did on a typewriter. He says he is producing drafts that require much less editing at the publisher, saving further hours for both the publisher's staff and himself.

He finds the short (about 6-pg.) files permitted by Easy Writer increasingly frustrating, which he discovered in his first book written completely on the Apple II processor. The chapters tended to come out about 6 pages each. Also, he has been able to print drafts only in units of one file with Easy Writer. He found that length comfortable for the book ("one of my books has one-page chapters"), but does not want to be limited in that way in the future.

"I'm running into the limits of this system," he adds. Among features he would like to see are longer files, enabling him to search over a larger part of his manuscript in one operation. He would also be able to make large block deletes and block moves when he wants to move a scene from one part of a book to another. In addition, he would prefer the faster response and better control of files paged continuously from an (inexpensive) hard disk. Swigart is watching carefully the development of the Apple III, hoping to buy one when a system that fits his expanding creative needs is available. □







THE COMMODORE LOGBOOK

by Mike Heck

The Computer Communications Arena

One of the areas generating the most interest in the computer field today is that of communication between computers. Besides being a valuable resource on its own, your computer can also access the resources of much larger systems and the data they contain. In addition, you can "talk" with other personal computers in order to exchange data, programs or even control one system from another. Following is an overview of what it takes to get started in the world of data communications and the equipment necessary.

The key to being able to do all this rests in a small device called a modem (modulator/demodulator). Basically all this unit does is convert the data from your computer into a form that can be sent over the phone lines, and in turn converts the data received over the phone lines into a form the computer can understand. Besides the modem, a software driver program is also needed for communication with other systems.

These programs vary in complexity. However, their basic task is to manage the data being transmitted or received. This might be formatting it properly on the computer's display screen or controlling the rate of speed the data is sent. This rate is referred to as baud rate and describes the number of characters per second sent or received. Normally it is set at a maximum of 300 baud.

Other common terms are full duplex and half duplex. Full duplex indicates two-way communication and is the normal mode of operation that will probably be used for most microcomputer applications.

Modems are manufactured and distributed by a number of different companies and take various forms. The Commodore modem, model 8010, is the acoustic coupler type, where the telephone handset is placed into the modem and a special microphone and speaker in the modem transmit and receive data through the handset.

The second type is a direct connect device, which plugs directly into the phone jack, then into the computer, eliminating the need for a telephone instrument. The advantage of the acoustic type is low cost, while the direct connect version offers better performance.

The next concern is connecting the modem to the computer. The Commodore 8010 modem contains a built-in IEEE-488 interface for direct hook-up to the Pet/CBM. Most other modems of the acoustic type come with what is known as an RS-232 interface. This is just a standard communication design that defines electrical signals and the actual connector. To get the proper signals from the computer to the modem, and back again, a special interface will be needed.

Companies offering standard RS-232 modems are Novation, Anderson Jacobson, Hayes, and Livermore, to name just a few. Livermore also manufactures an IEEE-388 version.

For interfacing, there are a number of ways to go. Madison Computer (Madison, WS) offers a complete package called Mc-TERM. This contains a special cable for connecting the Pet/CBM to an RS-232 modem. Also included is a very powerful terminal program that performs most communication functions. With a modem and Mc-TERM, you can do most any data communications function. In general, these functions would include transmitting and receiving files from another computer, saving what is sent to disk, printing information sent, and perhaps converting programs.

Mc-TERM allows the user to select baud rate, send and receive files, handles Pet to ASCII and ASCII to Pet code conversion, and also includes a way to convert programs from a different brand computer into a form the Pet/CBM can understand. The reason why the ASCII conversion is important is because normal communication is handled in the ASCII format, while the Pet/CBM doesn't understand this format without the conversion.

Converted programs will have to be further modified to run on Pet/CBM systems, because the different dialects of the Basic language are unique to each machine. Programs sent from one Pet to another will run without any changes. Imagine being able to send programs immediately across town with little delay.

The SADI hardware interface from Connecticut Microcomputer, Brookfield, CT, contains both a serial and parallel interface. With it you can attach a modem and also a parallel printer at the same time.

For separate driver programs, the SX-100 program from ECX Company, Walnut Creek, CA, is an excellent choice for use with any modem, especially the Commodore 8010. SX-100 handles printers, transmission of programs, saving transmitted information to disk and reading/printing those disk files.

Modem-Ware from Halpurr Software, Los Gatos, CA, offers special utility programs designed for telecommunication networks or direct computer-to-computer communication over standard telephone lines. All programs work on any Pet/CBM with a minimum of 8K memory and require an IEEE-488 modem. Modem-Ware programs support printers, disk utility functions, uploading of files and program conversion.

Orion is Commodore's terminal program. It is designed especially for the CBM 3032 CPU and 8050 disk. It handles file transfers and saving communications to disk, and also contains an elapsed-time clock to monitor time spent on the host system, the ability to print individual screens or the whole disk file, and setting duplex format.

If you want to go the direct connect route, TNW makes its 488/103 modem especially for IEEE-488 systems like the Pet/CBM. Supplied with it is the TNW terminal program software, which handles both auto dialing and other communications functions.

Once you've decided on the equipment and interfacing needed, what can you do with the gadgetry? Besides the normal sending and receiving of program and data files from remote locations, the next logical step is to experiment with one of the commercial data bases such as The Source. By conversing with these large computer systems, you have instant access to news stories, electronic mail, stock quotes, airline schedules and a host of other specialized services.

For a more specialized use of vast information held in these large computer systems, PMS system is now available for Pet/CBM computers. It provides the serious private or professional investor immediate access to pricing and financial information available through the facilities of Dow Jones computerized electronic information services, and additionally functions as an accounting and control system for security portfolios.

The system allows updating and maintenance of stock portfolios, automatic valuation of positions in the portfolio (all prices are delayed 15 minutes), retrieval of current and historical quotes and displaying/printing of news stories from as recent as 90 seconds or as far back as 90 days. This data is available for over 6,000 stocks and selected news categories in the Dow Jones data bases.

Customers can also access Media General Financial Services, which provide detailed price, dividend and fundamental financial data on all listed New York and American Stock Exchange companies plus 800 Over-the-counter companies. Users can recall *Wall Street Journal, Barrons',* and Dow Jones News Retrieval stories by stock symbol and other news categories. PMS features easy-to-use screen data entry for buys, sells and cash transactions. A complete year-to-date transaction audit trail and portfolio summary report are standard. The system provides a graphic display of historical prices and a printed copy of news stories, historical prices and the graphic displays.

The Dow Jones Portfolio Management System runs on the Commodore Pet model 2001 microcomputer with 32K memory or the model 4032 system. A Commodore model 4040 or 8050 dual disk drive is required for operation.

Because each program, modem and host system are unique, it would be impossible to describe all in detail, so let's take a look at what it takes to use a Commodore 8010 modem, Orion, and The Source. To use the modem, it is only necessary to have it connected via a cable from the computer's IEEE-488 port, either directly or from another peripheral. Then load and run the Orion program. Orion will prompt you with a selection to enter the time and date. These are optional, so the user can just type B for Begin.

You will then be shown options to Converse, Full Converse, Receive or Send Files, Directory, Print a Spooled disk file, Set Duplex, or Quit.

Next, select option #1, Converse, and dial the number of the host computer in your city (a local call) and place the telephone handset in the modem. In a few seconds the host computer will respond with its identification and will prompt you to enter the name of the particular system you want to access to. It then asks for your ID number or account number. Once that's done, you can request any service available.

During this time you can save what is going on between the host system and the Pet/CBM onto disk or print individual

```
10/01/81   09:29:34           ORION              FD      Elapsed:  00:00:00

please type your terminal identifier
-1173-033-
please log in: source10;+

  remote:  call connected
Primecom Network System 10

 Please Sign On
>id xxxXXX
Welcome to System 10                  Prime System 2.9H(10)
On At 14:30 10/01/81
Last On At 14:26 09/29/81

***************************  It's New!  ************************
* "Take Care of Yourself," Dr. Vickery's                         *
*     Home Medical Guide Is Now On Line!...........INFO CARE     *
******************************************************************

The "Indicator Digest"
       on what to do with your money................DATA COMMENT

Commands: 1. Converse          5. Directory
          2. Full Converse     6. Print SPOOL      Selection ? 1
          3. Receive File      7. Set Duplex
          4. Send File         8. Quit
```

Sample output from The Source

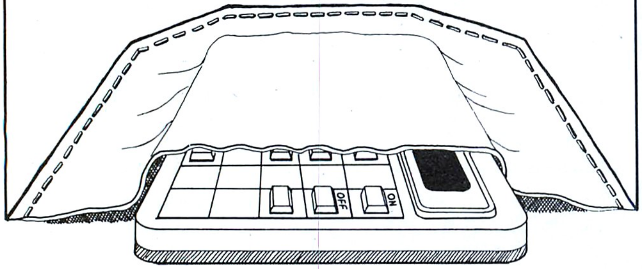
transmitted screens. The disk files can later be printed, if necessary for a permanent record of the transaction. The figure is a sample view of a session on The Source. It shows the power inherent using this type of information source.

The first lines show the response of the host system and the log-on procedure. The next few lines provide information on new services available on the system. At the '>' prompt, "upi" was entered by the user to gain access to the UPI news service. After that, national business news was requested, and scanning forward through the headlines of the stories was available. From that point, the system responded with the stories selected. That's all there is to it.

The user could just have easily asked to read the mail, made airline reservations or checked other news categories. □

POWER IN YOUR POCKET

by Bob McElwain



The Pocket Computer Goes to School

When electronic calculators first appeared in classrooms, some teachers objected strongly. They claimed students would never learn fundamental calculating skills. While the debate raged, creative teachers worked overtime to implement the use of calculators. I remember a chemistry teacher who lamented, "Now they'll never learn how to use a slide rule." Today I don't know where to go to buy that slide rule youngsters were supposed to learn to use.

I anticipate another explosion: Students with handheld computers will soon descend on schools. Radio Shack's TRS-80 Pocket Computer is readily available; Sharp, Quasar and Panasonic are here; others are coming. Already, creative teachers are implementing the use of handheld computers in classrooms.

In science laboratories, for example, some experiments require tedious calculations before conclusions can be drawn. Although it's important to know how to perform these calculations, erroneous computation can defeat the purpose of the experience. Teachers are providing programs in handheld computers for student use. Attention is focused where it belongs—on understanding the principles involved.

Some mathematics teachers find the experimental approach used in science of great value in mathematics classrooms. Experiments in probability come to mind. There are others in which data are gathered to derive a formula.

Innovative teachers use handheld computers in business education. In shop classes, they're useful in extended calculations often ignored because of difficulty. In the social sciences, simulations are included that were previously omitted due to messy calculations. The computer is used as calculator, monitor and guide. To the extent data are gathered, the computer handles statistical analysis.

Programming and mathematical skills can be developed hand in hand.

An exciting opportunity exists with handheld computers: to develop computing skills along with mathematical skills. Each supports the other nicely. A not-so-simple program can be written to solve the general quadratic function. The computer can then be used to verify paper and pencil efforts. Programming and mathematical skills can be developed hand in hand.

Students are usually interested in finding if their results are correct. If a result is incorrect, it's always difficult to convince them to find where and why they went astray. One reason can be the size of the task. If the solution to a problem fills half a page, it's a challenge to check all of it. A computer program that provides intermediate results can be extremely useful. When students are shown a specific part of their work that is incorrect, they're more willing to seek the source of the error.

Readers who have interesting pocket computer applications utilized in their classroom are invited to send in their ideas. We'll share some of them in this column.

Solving equations

It's unrealistic to ask students to solve an equation such as $Y = \sqrt{3}X^5 - 7\sqrt{7}X^3 + 5\sqrt{37}$ with pencil and paper. Far too much time will be spent in nonproductive computation. Yet it's misleading to allow students to leave a classroom believing that $Y = X^5 - 1$ is a typical fifth order function. Most functions, derived in the real world, have distinctly non-elegant solutions. If handheld computers are used, no problem of this type is off limits. Let's examine a simple program that could be used to solve the above and any polynomial function of the fifth degree or less.

It's possible to write a program to solve such functions directly, at least within certain bounds. But for student understanding, begin with a program that first provides the information required to plot the function. Provide another to find a specific root. This format provides a better view of what's happening, than a complete solution buried within the computer. The following program for the Sharp or TRS-80 pocket computer is written according to the above design.

The first segment of the program provides for entry of the coefficients and constant term, any of which may be 0. If A = 0, a fourth order function can be dealt with.

The design of Plot, the second segment, provides for the entry of a starting point, such as X = 0, an increment (perhaps one) and a limit or maximum value for the function, beyond which computation is meaningless. The program

computes values of the function in one direction along the X-axis, until its value exceeds the limit entered. Then values are computed from the starting point in the opposite direction.

This change of direction can be accomplished manually by restarting at line 120. If this is to be the pattern of use, all code related to reversal can be omitted. There is no logical exit from this segment. An exit can be added by setting a counter. When the counter is two, X has been incremented in both directions. Exit to Solve.

From a sketch of the curve, good starting points for each root can be determined. The routine used in Solve depends upon approaching a root from a value of X that gives a positive value for the function.

Since Y is computed in three different places, I used a subroutine beginning at line 500. If you're not acquainted with the notation, clear the parentheses. You'll find the result is $Y = AX^5 + BX^4 + CX^3 + DX^2 + EX + F$. Higher order functions can be solved by changing this line of code and adding input statements for additional coefficients required.

When the program has been loaded, type RUN and enter the coefficients and constant term. Values of the function will then be computed and displayed. Use this output to plot the function.

When the sketch is complete and starting points have been determined "RUN 300" for Solve. The function must be positive at a starting point. The increment must be selected so that X is increased or decreased in the direction of the root. An increment of one usually works, but a smaller increment will be required for some functions.

Pocket exchange

If you bought a pocket computer from Radio Shack, you're entitled to a free subscription to the *TRS-80 Microcomputing News*. Each month, one section is devoted to the TRS-80 PC. If the salesperson who assisted you did not arrange for your subscription, send a copy of your receipt of purchase to Editor, Box 2910, Fort Worth, TX 76101. You should receive a full year subscription free...

Foy, Inc. has announced a Planning Pocket Computer for extruders. Loaded with their program, the TRS-80 PC calculates "optimum extrusion press practices." It's designed for use by the press foreman, to determine the best way to handle last minute demands. I know nothing about extrusion processes or this program, but the program description is impressive. For further information, contact Foy, Inc., 205 College St., Farmersville, TX 75031, (214) 782-7282.□

Listing

```
 10: PRINT "COEFFICIENTS"
     - Get coefficients and constant
 20: INPUT "A=";A
 30: INPUT "B=";B
 40: INPUT "C=";C
 50: INPUT "D=";D
 60: INPUT "E=";E
 70: INPUT "F=";F
     - Begin PLOT routine
100: PRINT "PLOT"
     - Get limit, max value of F(X),
       beyond which computation ends
110: INPUT "LIMIT? ";L
     - Get starting point for plot
120: INPUT "START AT X = ";X
     - Hold start point for reverse
130: M=X
```

```
     - Get increment, amount by which
       X will be increased
140: INPUT "INCREMENT BY? ";K
     - Start routine here.  Go sub
       for value of function
150: GO SUB 500
160: PRINT "X=";X;" Y=";Y
     - Get next X
170: X=X+K
     - Is function beyond limit?
180: IF ABS(Y)<L THEN 150
     - Now increment in opposite
       direction from initial start
190: K=-K
200: X=M
     - No exit from this segment
210: GO TO 150
     - Begin SOLVE routine
300: PRINT "SOLVE"
     - Get accuracy required
310: INPUT "ACCURACY REQUIRED? ";L
     - Get starting point for a
       particular root
320: INPUT "START AT X = ";X
     - Increment in direction of root
330: INPUT "INCREMENT BY? ";K
     - Get value of function.  If
       negative, routine will fail
340: GO SUB 500
350: IF Y>0 THEN 390
360: PAUSE "F(X)<0 AT X = ";X
370: PRINT "TRY AGAIN!"
380: GO TO 320
     - Start routine. Get Y value
390: GO SUB 500
     - Get next X
400: X=X+K
     - If function negative, have
       passed root
410: IF Y>0 THEN 390
     - Get previous value of X
420: X=X-2*K
     - Display approximation
430: BEEP 1: PAUSE "X=";X
     - Decrease increment
440: K=K/10
     - If K<L, accuracy achieved
450: IF ABS(K)>=L THEN 390
460: BEEP 5: PRINT "FINAL X IS ";X
     - Return for next starting
       point.  No exit this segment
470: GO TO 320
     - Subroutine: EVALUATE FUNCTION
500: Y=((((A*X+B)*X+C)*X+D)*X+E)*X+F
510: RETURN
520: END
```

Sample run

Solve: $Y = X^5 - 7X^4 - 18X^3 + 126X^2 + 45X - 315$

```
COEFFICIENTS
A=? 1
B=? -7
C=? -18
D=? 126
E=? 45
F=? -315
PLOT
LIMIT? 999
START AT X = 0
INCREMENT BY? 1
X=0. Y=-315.
X=1. Y=-168.
X=2. Y=55.
X=3. Y=144.
X=4. Y=-39.
X=5. Y=-440.
X=6. Y=-693.
X=7. Y=0.
X=8. Y=2989.
X=0. Y=-315.
X=-1. Y=-224.
X=-2. Y=99.
X=-3. Y=360.
X=-4. Y=-143.
X=-5. Y=-2640.
SOLVE
ACCURACY REQUIRED? .0001
START AT X = 2
INCREMENT BY? -1
X=2.
X=1.8
X=1.74
X=1.733
X=1.7321
FINAL X IS 1.7321
START AT X = 3
INCREMENT BY? 1
X=3.
X=3.8
X=3.87
X=3.872
X=3.8729
FINAL X IS 3.8729
```

Two other solutions, not shown, are the negative of the above: X = −1.7321 and X = −3.8729. The fifth root, X = 7, can be identified in the points to be plotted. Integral roots can only be approximated by "Solve".

Buying new software is the pits, isn't it?

You read an ad and it sounds terrific, so you ask around, then buy the manual.

So far, so good—so you spring several hundred dollars for the package.

And it does exactly what they said. But to get exactly what you want, you're going to have to change the way you run your business. Or go through so much hassle that you're not sure it's worth it.

So you grit your teeth and suffer, or put it on a shelf to gather dust.

Sounds familiar, doesn't it?

But there is at least one known exception: an exceptional DBMS called dBASE II.

For database fans, an offer you shouldn't refuse.

dBASE II is the only high-performance relational Database Management System for micros. And it's the only DBMS that can help you get the DBMS that's right for you, no matter which DBMS you may want. Here's how:

If you have a 48k micro with CP/M, send us its model number and the size of your drives along with $700 (CP/M 86 version soon—call if you can't wait).

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Hardware Evaluation

CLK-24
A REAL-TIME CLOCK/CALENDAR MODULE

by Roger H. Edelson

If the availability of a real-time clock calendar on your S-100 bus system appeals to you, you might consider the CLK-24 board from Dual Systems Control Corp., Berkeley, CA. In addition to the above features, the module comes complete with a battery backup that provides continuous time keeping even with the computer power off. It is guaranteed to operate for at least one year without battery replacement.

Dual Systems is a relatively new kid on the S-100 block, having started by making a very reliable, easy to interface A/D converter. The company has now added this industrial grade clock module built around a CMOS LSI chip, and a non-volatile CMOS memory board. This offering is in keeping with their other cards—a highly reliable, well designed and well produced product.

The card is designed to operate with any computer that meets the IEEE 696 S-100 standard and features full socketing for all the integrated circuits, switch selectable I/O port addressing and a gold plated edge connector for reliability. The board has been flow-soldered, and all the feed-thru holes have solder fillets, contributing to the board's professional appearance and reliability. The solder masking is excellent, as are the board labels—most of the important signal lines that appear on the front side of the board are marked.

The CLK-24 is designed around a newly available CMOS LSI, clock chip (MSM5832), by OKI Semiconductor that features an extremely low standby current drain, enabling one year of life for the batteries that supply the standby power. The integrated circuit provides both time keeping (seconds, minutes, and hours—including either 12 or 24 hour format), and calendar (day, month, year, and day of the week) functions. The clock circuit will even remember to change the day and date correctly during leap year.

The clock timing is controlled by a 32.768 kHz tuning fork resonator with a normal accuracy of less than ± 20 parts per million, giving a timekeeping error of less than ± 50 seconds per month. The frequency of the clock oscillator can be adjusted by an onboard trimmer to adjust the overall clock accuracy. The module also provides jumper selectable interrupts every minute, second or 1/1024th second. These intervals may be jumpered to any of the eight S-100 interrupt levels.

As mentioned previously, the board is I/O mapped and uses two consecutive port addresses that can be switch selected to line anywhere within the 256-port address space. The timekeeping and calendar functions/data may be accessed very easily through the use of either assembly language (8080/Z-80/8085) IN and OUT instructions, or by the Basic INP and OUT commands. To guard against inadvertent changing of the time, the board is equipped with switch selectable write protection. The rightmost dip switch on the port address selector provides this feature by opening the line to the write (WR) pin on the OKI chip. With this line open, it is impossible to write data into the integrated circuit under normal operating conditions.

As there are instances when it is necessary to set the time (and the board cannot always be left in the write

Time/date read program

```
1000 DIM D(12)                    :REM  AN ARRAY FOR TIME AND DATE
1010 CONTROL=241:DTA=240          :REM  SET NAMES OF CONTROL AND DATA PORT
1020 FOR I=0 TO 12                :REM  LOOP FOR ALL 12 DIGITS OF INFO
1030 OUT CONTROL,I                :REM  SET UP TO READ I<TH DIGIT OF DATA
1040 D(I)=INP(DTA)                :REM  READ DIGIT AND SAVE IN ARRAY
1050 NEXT I
1055 OUT CONTROL,64               :REM SEND "CLEAR" CONTROL CODE
1060 D(5)=D(5) AND 7              :REM  STRIP 12/24 HR BIT (BIT 3)
1070 IF D(5)>3  THEN M$="PM" ELSE M$="AM"  :REM CHECK BIT 2 FOR AM/PM
1080 D(5)=D(5) AND 3              :REM  STRIP AM/PM BIT (BIT 2)
1090 D(8)=D(8) AND 3              :REM  STRIP LEAP YEAR BIT
1100 P$=""                        :REM  SET PRINT STRING TO NULL
1110 FOR I=0 TO 12                :REM  LOOP THROUGH ALL DIGITS
1120 P$ = HEX$(D(I)) + P$         :REM CONVERT TO ASCII AND ADD TO STRING
1130 REM  NOTE THAT EACH NEW CHAR IS ADDED AT LEFT END OF STRING
1140 NEXT I
1150 FOR I= 0 TO D(6)             :REM  COUNT UP TO DAY OF WEEK
1160 READ DAY$                    :REM  READ NAME OF EACH DAY
1170 NEXT I                       :REM  EXIT WHEN WE REACH THE RIGHT DAY
1180 REM  NOW PRINT DAY    MONTH/DAY/YEAR
1190 PRINT DAY$, MID$(P$,3,2) + "/" + MID$(P$,5,2) + "/" + LEFT$(P$,2),
1200 REM  NOW PRINT       HOUR:MIN:SEC   AM/PM
1210 PRINT MID$(P$,8,2) + ":" + MID$(P$,10,2) + ":" + RIGHT$(P$,2), M$
1220 RESTORE                      :REM  RESET READ DATA
1230 GOTO 1020                    :REM  READ DATA AND TIME AGAIN
1240 DATA "SUN","MON","TUES","WED","THURS","FRI","SAT"
```

Time/date set program

```
10   CONTROL=241:DTA=240                :REM PORT ADDRESSES
20   DIM SET(12)                        :REM ARRAY TO HOLD DATA
30   FOR I= 2 TO 12                     :REM LOOP FOR ALL DIGITS BUT SECS
40   READ MES$                          :REM READ A PROMPT
50   PRINT MES$;                        :REM PRINT IT
60   INPUT SET(I)                       :REM INPUT ONE DIGIT
70   NEXT I
80   INPUT "AM? (Y OR N)",A$            :REM ASK IF AM OR PM
90   IF A$="N" THEN SET(5)=SET(5)+4  :REM SET PM BIT TO HOURS DATA
100  FOR I= 0 TO 12                     :REM LOOP TO WRITE ALL DIGITS
120  OUT DTA,SET(I)                     :REM SEND DIGIT TO DATA PORT
130  OUT CONTROL,16+I                   :REM SEND WRITE CODE + CONTROL CODE
140  OUT CONTROL,64                     :REM SEND "CLEAR" CODE
150  NEXT I
160  DATA "MIN 1","MIN 10","HR 1","HR 10"   :REM DATA FOR TIME PROMPTS
170  DATA "DAY OF WK? (SUN=0 .. SAT=6)"     :REM DAY OF WEEK PROMPT
180  DATA "DAY 1","DAY 10","MO 1","MO 10","YR 1","YR 10"  :REM DATE PROMPTS
```

Figure 1. Basic programs for reading/setting the CLK-24

protected mode), the designers have included additional protection features in the design. The CLK-24 monitors the S-100 power supply and deselects the board when the power starts to drop. If your system provides the PWRFAIL* (power fail) signal listed in the IEEE standard, the board supports the protocol established for this line during power fail conditions. When the signal goes high, the CS (chip select) input to the clock chip is deactivated, protecting the time data from inadvertent change. Further protection is built in by designing the board so that data can be written to the clock circuit only after the proper sequence of instructions has been executed. In this way a single random OUT instruction will not change the time/date information.

One proof of all these protection features is that, as shipped, the timing module is in full operation with the

F #	Function Bits C C C C 3 2 1 0	Data Type	Data Bits D3 D2 D1 D0	Data Limits (Digit)	Notes
0	0 0 0 0	1 Seconds	B3 B2 B1 B0	0-9	Seconds are reset to zero whenever a write is executed to these registers.
1	0 0 0 1	10 Seconds	- B2 B1 B0	0-5	
2	0 0 1 0	1 Minutes	B3 B2 B1 B0	0-9	
3	0 0 1 1	10 Minutes	- B2 B1 B0	0-5	
4	0 1 0 0	1 Hours	B3 B2 B1 B0	0-9	
5	0 1 0 1	10 Hours	F A/P B1 B0	0-2	F=0 for 12 hour format, F=1 for 24 hour format. A/P=0 for AM, A/P=1 for PM
6	0 1 1 0	Day of Week	- B2 B1 B0	0-6	0=Sunday .. 6=Saturday
7	0 1 1 1	1 Day	B3 B2 B1 B0	0-9	
8	1 0 0 0	10 Day	- L B1 B0	0-3	L=1 for Leap year, Otherwise L=0.
9	1 0 0 1	1 Month	B3 B2 B1 B0	0-9	
10	1 0 1 0	10 Month	- - - B0	0-1	
11	1 0 1 1	1 Year	B3 B2 B1 B0	0-9	
12	1 1 0 0	10 Years	B3 B2 B1 B0	0-9	

B0,B1,B2,B3 are bits of binary representing the digit being read or written to.

F, A/P, and L are status bits which set the status of the clock when written, and allow the clock status to be determined during a read cycle. The Data Limits do NOT include these status bits.

Figure 2. Explicit description of control codes

backup battery supply in place. After turning off my system power, and checking to see if the batteries and their clips did not touch the next board, I inserted the CLK-24 into the S-100 bus and applied system power. Calling up Basic, it was then very simple to use the program provided to read the board. I found to my delight that the time was within 20 seconds of the correct value. The simple Basic program to determine the time, date, and day of the week provided in the manual requires only 25 lines and will read the information in less than 0.5 sec (figure 1).

Error is possible

The half-second value mentioned above is quite critical. If it is exceeded, there is the possibility of reading the time incorrectly. In the worst case, it could be off by one hour. This potential source of error occurs if the time changes just after a digit has been read, i.e. if your program reads the clock starting with tens of hours and ending with minutes, with the time changing from 2:59 to 3:00 just after it has read the hours.

In this case the time will be incorrectly read as 2:00 instead of 2:59 or 3:00. The CLK-24 provides circuitry to circumvent this problem—a monostable latches the value of time during a read for approximately 0.5 second. Only the data output of the clock circuitry is held for this half-second interval so that all of the readings taken during this period will be consistent, the internal timekeeping process is not halted—and the clock accuracy is unimpaired.

If your program must read the time more than once per second (for example, if the control, or program function is looping while waiting for the correct time to appear) information must be provided to the clock chip that you are between readings. This is done by sending the CLEAR control code (OUT base addr + 1, 64) to the board, which clears the monostable and allows the clock to advance. This code is sent whenever the program is between complete date/time readings. If this command is not executed, the monostable circuitry will complete the half-second timing interval allowing the clock chip to advance, regardless of whether or not the program has finished reading the entire time.

A complete listing and description of the control codes is presented in figure 2, where the function bits are the low order four bits of the control register which are set by an output to the board base address plus 1. The control register definition is shown in figure 3. Therefore, to read the 1 hour information, the program must first OUT to PORT + 1 and 04H code, then input the value by doing an INP from the PORT address. If it was desired to set the 1 hour value, then the control operation would be to OUT a 14H code. The control codes are latched into a 74LS273 Octal Register by the OUT operation (the S-100 bus signal SOUT is used to generate the latching clock) where they are used to determine the operation. In the case of a writing operation, however, the data must be sent first to the board base address, so that it may be stored in the data latches.

The most significant bit of the control register definition is labeled HOLD DISABLE. This bit allows more direct user control of the clock board to enable faster reading of the time/date values. This permits the computer program to override the automatic HOLD generation and wait state circuitry included on the board when required by assembly language interrupt driven systems. The manual states, "This is only suggested for assembly programs that are interrupt driven or for systems that cannot tolerate the 150 μsec wait states." The manual even presents a complete date/time program using the HOLD DISABLE pin; in this case, the data is read twice and the two readings are compared to see if the time had changed from the first to the second. If the time did change, the procedure is repeated until two equal values are obtained.

The CLK-24 is delivered as a fully assembled and tested board for $250 with the timekeeping enabled and alkaline batteries installed. For those users who wish a longer duration backup supply, it is possible to replace these batteries with nickel-cadmium types with a minor circuit alteration. To modify the board it is only necessary to replace a 1N4002 diode with a 100 ohm ¼ watt resistor. After this replacement is made, the CLK-24 will automatically recharge the batteries when computer power is on. The price paid for this conversion is that the timekeeping function is only reliable for 90 days between charges, which is certainly sufficient for most uses.

CONTROL REGISTER
(switch address + 1)

D7—	hold disable
D6—	clear
D5—	X
D4—	write
D3—	B3
D2—	B2
D1—	B1
D0—	B0

"X" means "unused"

Figure 3. Control register definition

The circuit design is excellent, generally meeting the specification of the IEEE S-100 bus standard with only two minor exceptions. In the case of the two port signals SINP and SOUT, the allowable current sourced by a bus receiver is exceeded by −0.3 ma—an insignificant amount. This problem occurs because both of these lines are unbuffered and drive two circuits. There are no other problems with the rest of the board. In fact, the designers have even included a diode in series with the main S-100 power line (+ 8V.) to protect against inadvertent application of reverse polarity. The boards manufactured after May 1981 have been re-productized to place the dip switch that sets the port address and the write protect feature close to the top edge of the board, where it is much more accessible than previously.

The CLK-24 is to be recommended whenever there is a requirement for automatic entry of time/date information, or any application requiring interval time sequencing plus the ability to continue the timekeeping function even when the main power is off. □

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Data General	to be covered in future issues	
Alpha Micro		
Ohio Scientific		

*Includes both compile and run time

**Program optimized by Radio Shack ran in 2:59.3

by Hillel Segal

With the wide variety of computer equipment available, it should be readily apparent that each microcomputer is designed for a special range of tasks. With the huge diversity of processors, storage systems, peripherals and software, careful assessment of needs is crucial.

The Apple II Plus has a very attractive entry-level price. In some situations, it can do the job cheaply, but if purchased for an application for which it was not designed, it may be a disappointment.

This unit is the eighth system to be evaluated in this series of tests on computers priced under $15,000. The Association of Computer Users also sponsors tests on computers in other price ranges, and all reports include measurement of run times for a set of programs, a survey of user satisfaction and additional information compiled by the consultants who perform the actual tests.

The Apple system tested included 48K bytes of memory, two single-density minidiskette drives, a 9-in.

black and white monitor, keyboard and Centronics model 779 printer. The suggested retail price of $4,330 is the lowest of the computers we've looked at so far.

One of the chief strengths of this system is that the low entry price does not exclude some expansion capabilities. Apple Computer offers superb high and low resolution graphics built-in, but boards with additional memory, high speed serial interfaces, clock/calendar cards, hobbyist gadgets, and many other specialties are available as accessories.

Additional applications possible

One frequently-added card, offered by Microsoft, is the Z80 softcard, a complete processor that can be teamed with CP/M to allow the entire range of compatible languages and applications to be run on the Apple. Floppy disk expansion using Apple hardware is limited to four drives. However, hard disk storage can be supplied by other vendors, if desired.

Apple's compact, one-board central unit holds an eight-slot motherboard that allows up to eight cards for accessories to be plugged in.

One question that arises from the vision of all those accessory devices and outside vendors is this: why pay extra money to add a Z80 softcard or hard disk storage for an Apple, when one could buy a Z80-based hard disk microcomputer to begin with? The extras are fine options for those who already own Apples, but for the prospective buyer this plethora of peripherals may be a mixed blessing. We see here the necessity of clearly defining one's needs and goals before purchasing.

Performance on the accounts receivable test, the standard benchmark being reported in this series, was mid-range among the twelve microcomputers tested so far in the under-$15,000 price range. Since the Apple comes in at the low end of the price range, it's mid-range performance should be considered a satisfactory showing.

The test program itself combines arithmetic and disk storage operations in a manner intended to simulate a user accounting package. Apple's time was 6 minutes, 17.4 seconds to complete the exercise and display results on the screen.

Our independent consultants noted that the Apple operating system offered good support for assembly language operations, plus PEEK and POKE commands to access the machine directly from Basic. However, they felt that the casual programmer might be confused by the necessity to issue such instructions from Basic often.

The consultants expressed one reservation about the Basic language disk access procedure. As the system is implemented, there are no open and close file statements; rather, there is a somewhat awkward method using print statements that allow only one device at a time to be open for input/output.

Apple also offers Pascal, Fortran, and an educational programming applications language, Pilot. The Pascal and Fortran packages require an accessory board containing an additional 16K RAM. All require a disk drive, unlike Basic on the Apple.

Applications software is available in abundance, thanks to the computer's popularity. The system's best use could be for management planning or personal finances—applications that do not require large storage capacity or a great deal of computing power. One of

the most popular tools is VisiCalc, the electronic spread sheet. The portfolio evaluator from Dow Jones was also well received as a personal management tool for stocks and bonds.

On the other hand, the Controller accounting package received mixed reviews from users who were surveyed during preparation of the benchmark report. Over half of them felt it was slow and difficult to adapt to their business. Another limitation is that more than a few hundred accounts are impractical on the system. Some users may have been oversold when they bought the system, thinking it could handle their size operation.

One area is definitely not the system's strongest: word processing. It was designed with a 40 character per line display, which allows a low enough resolution requirement that any TV set can work as a monitor. But this is impractical for many word processing functions, since a typical typewritten line has 60 or 65 characters on it. In addition, Apple II comes with upper-case display only.

Of the several packages on the market, some simply work within the upper case limit and short line. True word processing would require purchase of additional internal hardware and a better monitor, as well as software and a high-quality printer. The newer Apple III systems are packaged with these features already included.

Most of the twelve users polled reported few hardware breakdowns and concurred that the equipment was quite dependable. Some felt that training and support from Apple was lacking in quality and availability, however. Others said the company's software hotline was helpful.

Local dealers come in all forms with the Apple, ranging from computer-only stores to stereo shops. Some are more accustomed to working with hobbyists than businessmen, so the customer would do well to ascertain the level of expertise of his dealer and the nature of the software support available before making a purchase. Interestingly, several users indicated light usage of their Apple—some were just running it at home. A number of users we contacted apparently were novices on computers and had purchased a low cost system to learn the ropes, intending to buy a more expensive system for business use later.

The great variety of hardware and software available and its low entry price are the system's strongest points. However, suitability for business applications must be evaluated in each case individually. While very flexible in the type of applications it can perform, expansion into large-scale accounting, word processing and record-keeping are not provided for in the design of the system. □

Hillel Segal is president of the Association of Computer Users, a non-profit association with members all over the U.S., Canada and several foreign countries.

One of the association's key activities is the publication of its Benchmark Reports. Each month a new report is produced covering a computer system.

In addition, ACU publishes seven bimonthly newsletters for users of small computers, midi computers, large computers, time-sharing systems, distributed processing systems, word processing systems and home and hobbyist computers.

A complete package of information about membership is available at P.O. Box 9003, Boulder, CO 80301.

Systems Group's System 2800

by Tom Fox

Systems Group of Orange, CA (perhaps better known by its earlier name of Measurement Systems and Controls) first came to our notice with a 64K-byte dynamic random-access memory (RAM) board designed for the S-100 bus—specifically for the tricky Alpha Micro application. Sticking always with the S-100 bus philosophy, the company has since introduced two kinds of Z80 central processing unit (CPU) boards, an 8-port serial input/output board and controllers for floppy and hard disk drives. Most of these have found their way into the very first Systems Group computer family, designated the System 2800.

The system comes as a compact box packed full of computer parts and disk machinery. Ordering the unit is largely a matter of selecting from a short menu of three kinds of disk drives, and cramming into the box any combination of two that will fit. The choices: 1) a single-sided, double-density diskette drive from Shugart, 2) a double-sided, double-density floppy diskette drive from NEC and 3) a 10M-byte Winchester-technology hard disk drive from Memorex. We recently had the opportunity to wring out the top-of-the-line combination: one each of 2) and 3).

This computer comes with the company's version of the CP/M multi-user operating system, created by Digital Research, Pacific Grove, CA. Other versions of the system are delivered with Digital Research's single-user CP/M operating system. The computer manufacturer promises an incarnation with multi-user Oasis in the near future.

Students of the evolving S-100 bus have been somewhat disappointed with the acceptance of IEEE's attempts to standardize a good idea. The S-100 bus is built around a mother board populated with 100-pin connectors. Individual boards—such as CPU and memory—are plugged into the mother board to construct an operating computer.


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The S-100 bus was widely copied by early micro manufacturers, often "improved" by each engineer who had a hand in the design. The result was a *de facto* standard, tarnished by the detail differences that evolved over time. Nonetheless, the S-100 bus idea is responsible for much of the growth of microcomputer popularity.

The Institute of Electrical and Electronics Engineers is an industry group chartered to bring order to just this sort of chaos. IEEE Standard 696 defines in considerable detail what an S-100 board *should* be, physically, electrically and operationally. In the process, the task group mapped the future of the S-100 bus by defining some important new functions, such as a way to connect slave CPUs into a multi-processor network.

Standard 696 has not been as well accepted as earlier hoped, largely because it necessitated design changes for nearly every S-100 product then in existence. Some computer manufacturers claimed that the new standard was flawed, and merrily proceeded with their own S-100 variants—proving once again that chaos remains a powerful force in our lives.

Systems Group sees this issue differently, giving the carefully considered IEEE standard the respect it deserves. Perhaps because the timing was right, *all* of the new Systems Group products are S-100 based, and *all* conform religiously to the provisions of Standard 696. Thus, the company's computers can be enhanced in future times with parts from other vendors who adhere closely to the IEEE standard.

Heading the list of the company's second generation S-100 products is the CPC-2810 CPU board. This unit is centered around the popular 8-bit Z80 microprocessor chip, operating at its current maximum rate of 4 MHz. It's a design chock full of the latest tricks given to us by the state-of-the-art: prioritized vectored interrupts with daisy chaining and programmable response, interrupt-driven real-time clock and space for an on-board 4K-byte erasable programmable read-only memory (EPROM). The CPU board can serve as a master in IEEE's multi-processing master/slave scheme. However, implementation of this capability awaits the development of suitable slave CPU boards, as well as appropriate operating system software.

In addition, the CPU board contains a generous measure of on-board input/output (I/O) communications channels, obviating the need for a separate card. Both serial and parallel I/O hardware are provided, and are handled in a unique manner. The components most closely associated with I/O at the CPU level are contained on the CPC-2810 board itself, whereas the parts that adapt the signals to specific terminals and printers are to be found on separate, tiny "personality boards."

Channel support

The personality boards bolt directly to the rear-panel connector appropriate to the external device, and are wired to the CPU board via small flat cables. In all, up to four serial and two parallel channels are supported. The serial channels can be upgraded for synchronous operation (used for certain high-speed data communications needs) by replacing some integrated circuit chips on the CPC-2810.

Without describing in detail the other S-100 electronics cards that make up the system, we can state that a similar attention to detail has been lavished in their designs. There are five main boards in the system we tested: the CPU card described above, a single/double density, single/double sided floppy diskette controller, a hard disk controller and a pair of 64K-byte dynamic RAM cards. These cards fit in a truncated 8-slot mother board placed just behind the front panel of the computer. Multiple users in the MP/M environment may require that one or more 64K-byte RAM boards be added, as well as an 8-port serial I/O board.

The physical layout is straightforward. The S-100 card cage occupies the left front quarter of the machine, followed behind by the computer's power supply. This is of conventional design, comprising massive transformer, rectifiers and capacitors. The input transformer features switchable 120/240 volt AC operation, as well as taps for high and low voltage conditions that might exist in a particular installation. The rear panel includes two auxiliary AC power sockets that are under the control of the front-panel main power switch.

Attention to detail has been lavished on the S-100 card designs . . .

Most of the right side of the unit is taken up with the disk drives. There are always two, placed one atop the other. The selected drives, whether hard or floppy, single or double density, have identical external dimensions. All contain disks or diskettes that are 8 in. in diameter. The space behind the disk drives is dedicated to interconnecting cables and the I/O personality boards. All major modules are removable for service.

A physical description of the system is not complete without discussing the least satisfactory of its features, the computer's appearance. The prototype models had an uncanny resemblance to a small window-mounted air conditioner, but this has been corrected in the production version. The aesthetics problem seems to be focused on the front panel, which is formed from a vacuum-molded plastic sheet. Beauty is admittedly a subjective matter, but we believe the capable System 2800 deserves a prettier face.

A back room full of tested (and rejected) disk drives from competing manufacturers attests to the fact that Systems Group did not select these important components haphazardly. The double-sided, double-density floppy drive is an NEC unit. It has by far the quietest operation of any floppy drive we have seen so far. The drive and controller have the intelligence to automatically adjust when the user inserts a single-sided or even single-density diskette. Up to 1.26M bytes (1.26 million characters) of data can be stored on a single diskette. The main function of the floppy drive is for making backup copies of the data on the hard disk, as well as providing a means to transport programs and data from other computers to the system.

The 10M-byte hard disk is a Winchester-technology unit by Memorex. It holds the data on a pair of small disks encased beneath a hermetically-sealed clear plastic bubble. It's fascinating to watch the disk head assemblies flick back and forth, as users make demands on the disk subsystem.

As delivered, the hard disk is divided logically into two devices, designated >E and >F in MP/M parlance. Device E occupies 8M bytes; F, the remaining 2M bytes. This is done so that the user can take advantage of the maximum file size (8M bytes) allowed by the software addressing in this machine.

The company has taken the time to make the MP/M operating system work really well on its computer. MP/M's introduction was flawed because of the special knowledge it takes to integrate it into a particular hardware configuration. This knowledge is generally beyond the capabilities of individual end users, even those able to perform similar installations with the simpler CP/M operating system.

The company has done some work to ease the bootup process, as well as making it simple to create bootable hard disk surfaces or diskettes in any conceivable format. All available random-access memory is scanned at boot-up time, and MP/M automatically adjusts itself to suit. There's a complication involving an oversized data buffer area when a double-density diskette is defined, but this is taken care of automatically as well.

The standard software package includes utilities such as a disk formatting routine that optimizes the sector interleaving for maximum speed of data transfer. Other than this, software is up to the dealer or end user to locate and integrate. Languages such as Basic or Pascal must be purchased from outside sources. The story is the same for the applications programs that make the computer worth owning in the first place. The chore of making such packages run is vastly simplified by the selection of the nearly universal CP/M (and compatible MP/M) as the resident operating system.

System passes the test

Testing the system gave us a good opportunity to exercise our Prime Number Cruncher benchmark program (IA Aug 81). Using Microsoft's version 5.1 Basic interpreter, we made controlled runs that compared the speed of CP/M as well as MP/M operating under both single- and two-user modes. Booted up under CP/M (version 2.2), the program gave us all prime numbers up to 1,000 in just 699 seconds. The same task under MP/M (version 1.1) took 756 seconds. This multi-tasking operating system evidently elicits an 8% overhead of processing load. As expected, two MP/M users finished the exercise in almost exactly twice the time, 1,518 seconds.

The top-of-the-line system described here costs $9,995. This includes the floppy and hard disk drives and 128K bytes of RAM—enough for two users. The MP/M operating system is included, as well. Additional memory may be fitted at a cost of $995 per 64K bytes. Simpler versions are available for as little as $5,035. The minimum system is a single-user CP/M machine with 64K bytes of memory and a pair of single-sided, double density floppy diskette drives. Terminals, printers and applications software must be added to the package to create a complete computer system. □

CIRCLE INQUIRY NO. 3

Educational Computing at the Crossroads

by Frederick W. Michael, Jr.
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7100 McCormick Rd.
Chicago, IL 60645

Classroom computers are becoming commonplace; many educators are already hailing them as the wave of the future at all levels of the teaching/learning process. But just when that wave will hit its peak is a moot question.

Strangely, the problem stems from the rapid development of affordable microcomputers with capabilities rivalling those of extremely expensive mainframe systems in use only a few years ago. The new microcomputers are based on technology that has been methodically developed during many years of designing and improving large mainframe and mini systems. The unexpected and sudden appearance of the microcomputer resulted from new manufacturing techniques that allowed a small desk-top unit to perform almost all the functions of the older units that required expensive air-conditioned rooms and row upon row of cabinets, consoles and tape systems.

While the software needed for the large mainframe systems was developed simultaneously with the hardware—over a period of many years—the software for classroom computers is limited simply because much of it must now be prepared from scratch and too few people know the Basic language.

Today's classroom microcomputers are deceptive in their power and capability. Part of this stems from their small size, part is a result of the fact that games like Star Wars can be played on them (implying that the units are toys), and part is due to the shortage of instructional software or courseware. Even the most sophisticated courseware rarely begins to tap the full capability of a classroom microcomputer.

Long before desk-top micros became available, some educators were experimenting with computer-aided instruction (CAI), using large mainframe and minicomputers that were designed for general bookkeeping and accounting rather than for student instruction. For more than a generation, CAI held out a promise that is only now approaching wide-scale fulfillment at all educational levels.

Existing CAI programs were mostly used in colleges and secondary schools, and in industrial/vocational training courses. These programs ranged from very sophisticated courseware developed uniquely for a given school to simple but unique remedial courses. CAI has been used for drill and practice, simulation and games. But educators now realize that its most practical use is in tutorial instruction.

Early CAI began in the mid '50s, when a program for teaching binary arithmetic was developed by IBM. By the '70s, a number of corporations had entered the CAI field with varying hardware and software. This lack of standardization gave rise to some teacher resistance and criticism—many educators were confused by the "alphabet soup" of courseware such as TICCIT, PLATO, MICA, IDF and others. All were designed with large mainframe computers centrally located with terminals in remote locations. These forms of CAI are

still in use all over the country; the number of schools involved is vast.

CAI programs for elementary school instruction consist basically of three kinds of systems: drill-and-practice, tutorial and dialogue. Drill-and-practice is the simplest and is intended to complement the teacher's instructions and give instant feedback to pupil performance. Tutorial CAI is more complex. It systematically presents new information to students with branching options depending on their progress. Dialogue is complicated but effective. It sets up two-way interactive communication between pupil and computer.

When microcomputers were first introduced in the classroom, many educators held the view that teachers without computer literacy would consider computers as competitors for their jobs and of very limited utility. But this hasn't been the reaction. Whether it's a seasoned teacher or a kindergartener who's encountering a microcomputer for the first time, it's very easy to get hooked. The monitor screen becomes a new and wonderful source of information that can range from how to spell C-A-T to intergalactic cosmology.

The advantages for students of custom written courseware are many.

Courseware doesn't necessarily exist for intergalactic cosmology at the moment, but it is inevitable someday. At present, teachers are busy examining what's available in off-the-shelf courseware, and that's also part of the learning process. There are about a dozen traditional publishing companies now in the business of supplying courseware, and there are programs for teaching various languages, grammar, history, geography, biology, spelling, math, earth sciences, chemistry, earthquakes, meteorology, memory retention, reading and visual perception.

Perhaps the most important advance from a teacher's point of view is the development of programs that show the teachers how to write courseware themselves—to whatever level of detail and sophistication they desire—to communicate with computers entirely in English. Instead of trying to fit off-the-shelf courseware into an existing curriculum, these programs enable teachers to create courseware tailored specifically for their students' needs.

At first glance this program writing seems a formidable idea. It appears unrealistic to expect teachers to become professional programmers. It takes years of study and practice to learn all the ins and outs of computer program preparation if it's done in the usual way. The trick is to prepare fundamental programs that can be adapted to specific subjects with minimal instruction.

The advantages for students of this custom written courseware are many; students respond best to courseware that is personalized and interactive. Once the student has typed his name on the keyboard, the computer begins a conversation, asks questions, provides hints, admonishes wrong answers and rewards correct ones—all by means of the monitor display. These programs provide a logical continuity and flow of ideas from simple to complex. The student only needs to type in his responses.

This same general approach can be used by the teacher to write the programs. With the teacher at the keyboard, the questions are different, but the same logical continuity is used. The major difference between interactive programming and the interactive courseware that results is the direction of information flow. The teacher puts requested information into computer memory to complete the program; the student takes information out of the computer through the question-and-answer process, or through the tutoring process when the computer is simply passing information directly to the student.

While the actual programs in the computer are a combination of letters, numbers, and signs that are completely unintelligible to anyone other than a professional programmer, both the teacher and student receive computer requests and provide answers in plain English. The power of interactive programming lies in the fact that teachers can write either short, simple courses or more in-depth versions. Any question can be asked of the student, and any information can be passed to him before or after the question.

The student provides answers to the questions, but the teacher preparing the courseware provides both questions and answers—the specified "right" answer and any number of anticipated "wrong" answers. Each wrong answer can trigger an appropriate response to the student, along with hints to help in selecting the right one. A right answer may trigger a complimentary remark and presentation of the next question or additional information. A standard response, such as "wrong—try again," can be presented to the student if his answer doesn't coincide with any of the answers the teacher has entered.

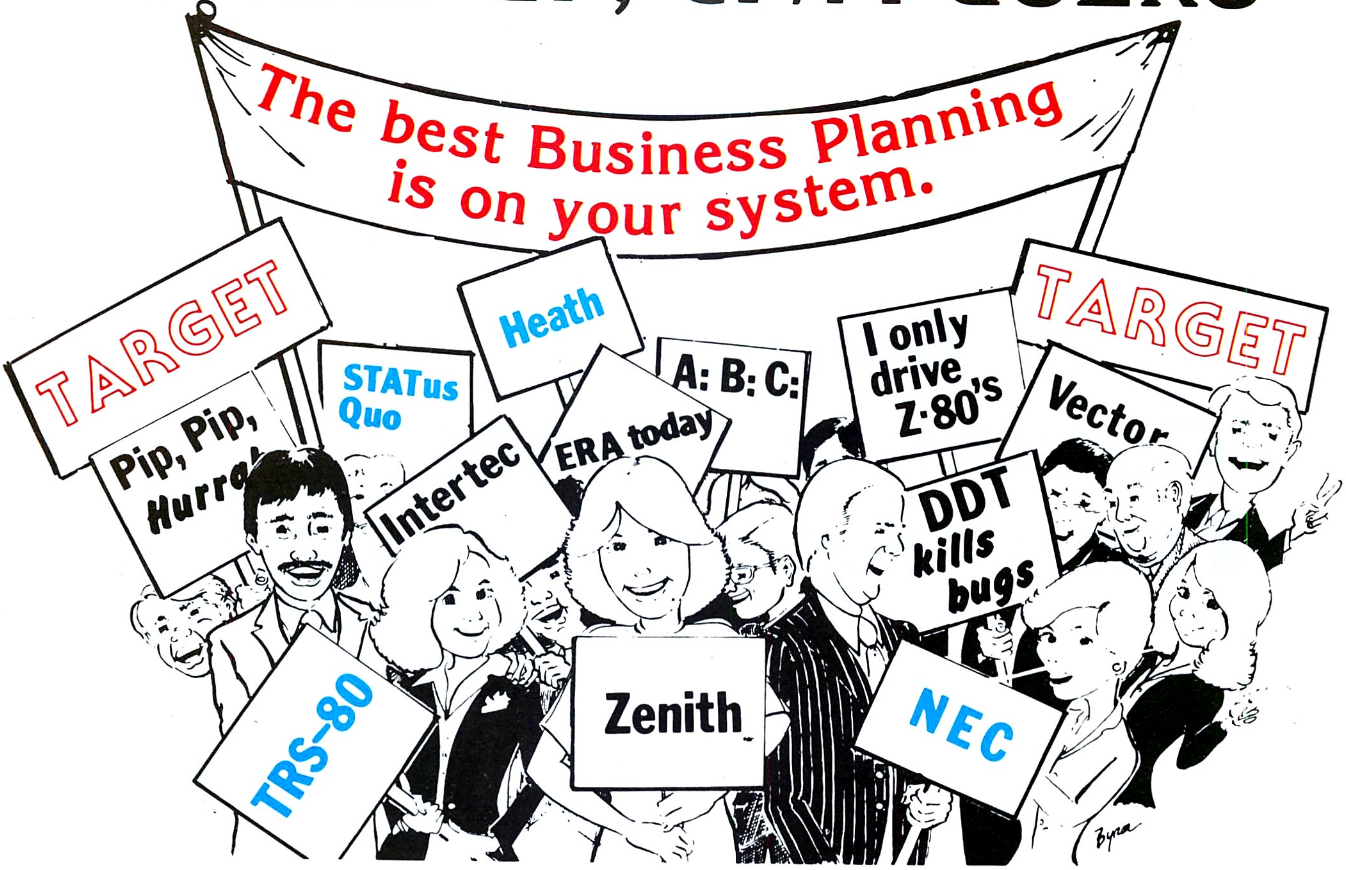
Computer offers corrections

If a designated number of wrong answers is given by the student, the computer can be instructed to break in with the right answer, move to the next question, or provide additional information—depending on how the teacher has written the courseware. At the end of an exercise or test, the computer can be programmed to add up the right and wrong answers and calculate a score. These results can be shown to the student or printed out for the teacher for later use.

The debate on the merits of programs prepared by professional programmers with the help of leading experts as compared with simpler, more personal custom-designed courses by individual teachers is not likely to be resolved soon. The reasons are many. A major factor at present is simply the lack of canned courseware on the market. While this may change in future years, professionally prepared courseware is expensive and must be mass-produced and distributed widely to bring costs in line with school budgets.

Continued on page 158

STAND UP, CP/M USERS



For the past few months you have patiently endured the indignity of watching your friends show off their flashy visible number cruncher on their game-playing computer and longed for something as slick.

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LINE 2 EXP = GROW 50 BY 15%
LINE 3 NET = SALES − EXP

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EXP 50 +B2*1.15 +C2*1 +D2*1.15
NET +B1-B2 +C1-C2 +D1-D2 +E1-E2

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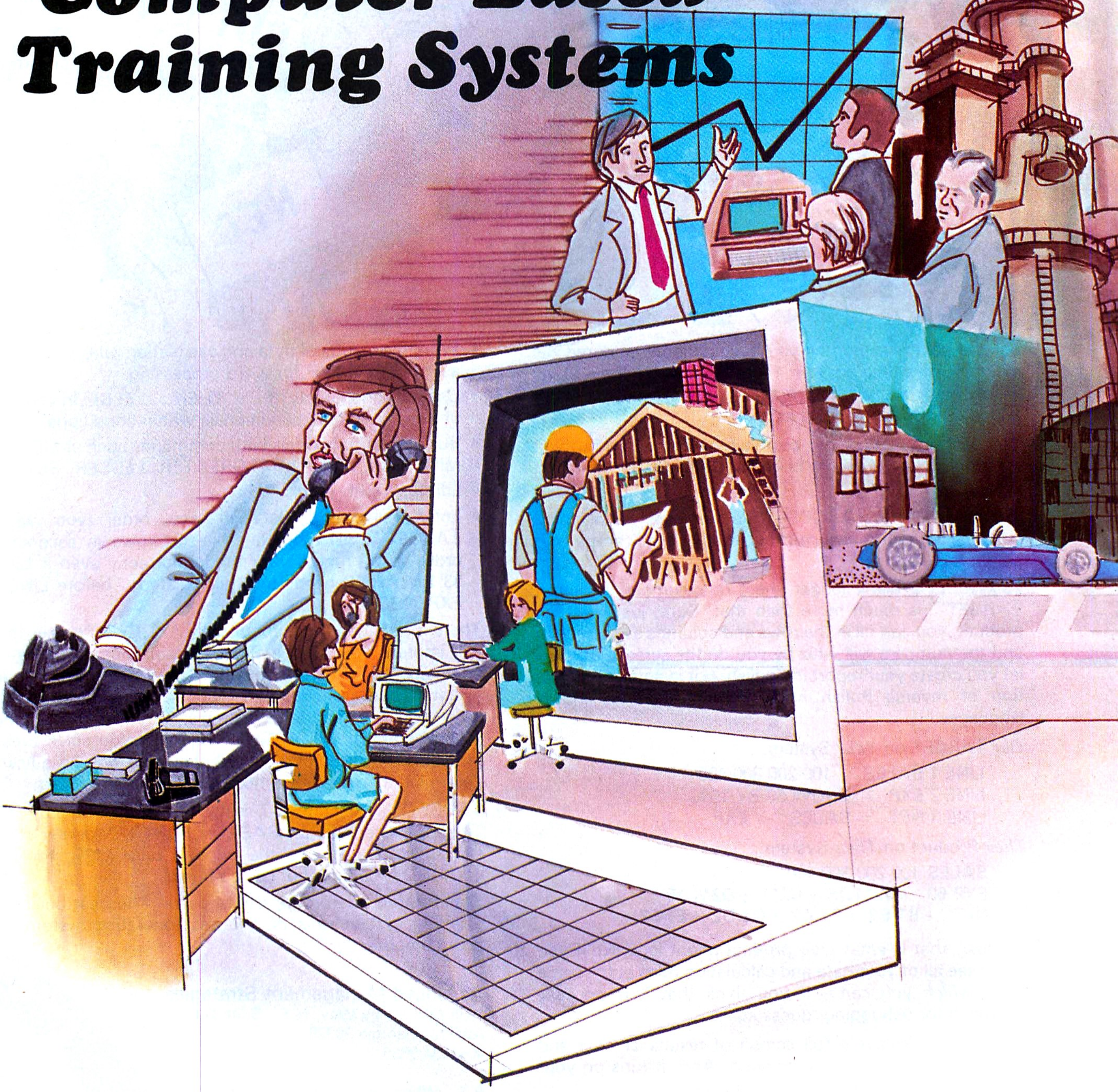
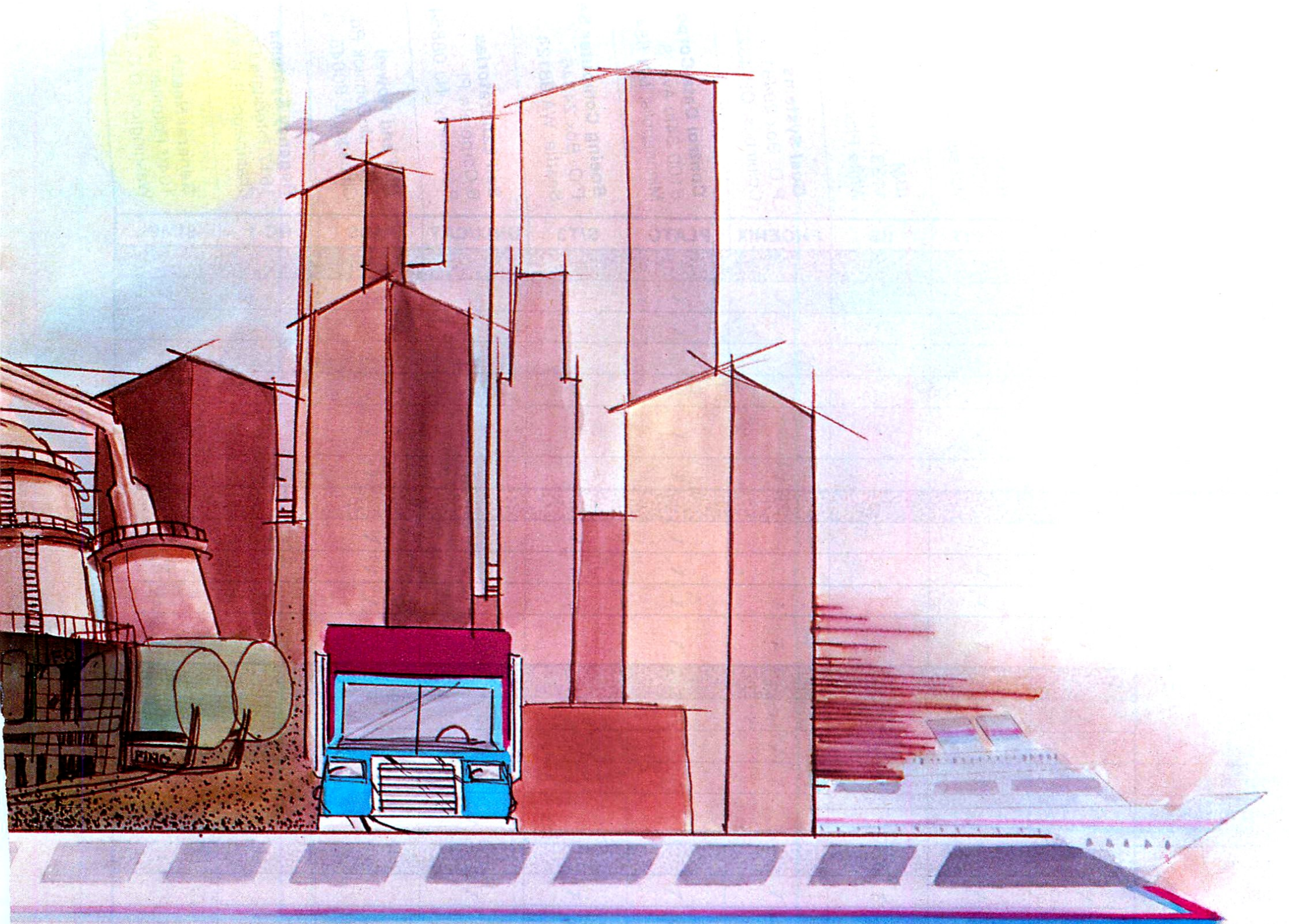
CIRCLE INQUIRY NO. 93

A Guide to Computer-Based Training Systems





by Dave Hannum

In today's environment, one of the most readily available pieces of equipment is the computer. So it is natural for our educational process to be moving towards the use of computers as a medium to impart learning. Thus we enter the world of Computer-Based Training (CBT).

Computer-based training is defined as any training activity in which learning results from the trainee's interaction with a computer. This interaction might be with a specialized computer devoted solely to training, or a trainee interacting with specialized software that permits the delivery of training—while the hardware system continues to do normal data processing work.

One form of CBT is known as "simulation." The computer either simulates itself in another mode of operation or represents the functioning of another piece of equipment that may be too expensive or too dangerous to use in training (i.e. some test equipment).

A second type of computer-based training is known as Computer Assisted Instruction (CAI). The computer provides the trainee with material in a verbal and/or graphic mode via a computer display, commonly a CRT screen. It requires the trainee to interact with the computer by responding to questions presented on the display. The computerization of individualized instruction provides the trainee with immediate information concerning the correctness of his responses. It also manages the trainee's progress through the material based on knowledge gained through his responses.

The last type of computer-based training, Computer Managed Instruction (CMI) manages a trainee's progress through a curriculum by administering criteria and diagnostic tests, then prescribing appropriate remedial activities for any deficiencies encountered. These remedial training activities include CAI activities or references to classic or traditional sources of study,

CBT Comparison Chart

Features	Global Information Systems, 201 W. Springfield, Champaign, IL 61820	Hazeltine Corporation, 7680 Old Springhouse Rd. McLean, VA 22102	IBM, 1133 Westchester Ave. White Plains, NY 10604	Goal Systems, P.O. Box 29481, Columbus, OH 43229	Control Data Corporation, 8100 34th Ave. S. Minneapolis, MN 55440	Boeing Computer Services, P.O. Box 24346, Seattle, WA 98124	Bell Laboratories, 6 Corporate Pl. Piscataway, NJ 08854	Bell and Howell, 7100 McCormick Rd. Chicago, IL 60645	Regency Systems, 1617 Interstate Dr. Champaign, IL 61820	General Health, 1046 Potomac St. N.W. Washington, D.C. 20007
	SIMPLER	**TICCIT**	**IIS**	**PHOENIX**	**PLATO**	**S/T3**	**UNIX/CAT**	**PASS**	**RC-1**	**SIMPL**
Graphics										
Full	✓	✓		✓	✓			✓	✓	✓
B/W	✓			✓	✓				✓	
Color		✓						✓		✓
None			✓			✓	✓			
Overlay other media on screen		✓			✓			✓		
Animation	✓	✓		✓	✓			✓	✓	✓
Control										
33mm slides	✓	✓			✓	✓		✓	✓	✓
Video tape/disc	✓	✓			✓	✓		✓	✓	✓
CMI	✓	✓		✓	✓		✓	✓		
Instructor/ Author Monitor	✓	✓		✓	✓					
Communications										
Realtime	✓	✓			✓		✓			
Other			✓	✓		✓				
Author language	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Interface w/other languages	✓						✓	✓		
Terminals										
Multi	✓	✓	✓	✓	✓	✓	✓			
Specialized	✓	✓		✓	✓	✓		✓	✓	✓
Networking for growth	✓		✓				✓	✓	✓	✓
Dedicated Processor	✓	✓								
Microprocessor								✓	✓	✓

such as workbooks or study guides.

Why should your company or institution be interested in CBT? If for no other reason, CBT is the eventual educational medium that will largely replace the stand up lecturer and the self-paced media of today. Also, CBT is cost effective and can be controlled at a central location with decentralized delivery. This delivery can be done at the resident location for the employee, thus eliminating the travel aspect to training delivery.

Further, the normal cost of training can be divided into three major categories—training center costs, training development costs and trainee costs. The largest of these is the trainee cost, which averages better than 60% of the total training budget in industry. With CBT this trainee cost can be sharply cut. Some recent industry studies show that the overall savings using CBT could amount to 20-50% of the total training costs.

The one cost that will rise from instituting CBT training will be the training development cost. However, this should not be a substantial amount, since the present makeup of training costs show development as only 5-9% of the total.

In order to understand this increase, an understanding of authoring and delivery systems used in CBT is needed. First, examination of authoring systems or languages shows that it is not merely a programmer coding information into a computer and coming out with

Continued on page 160

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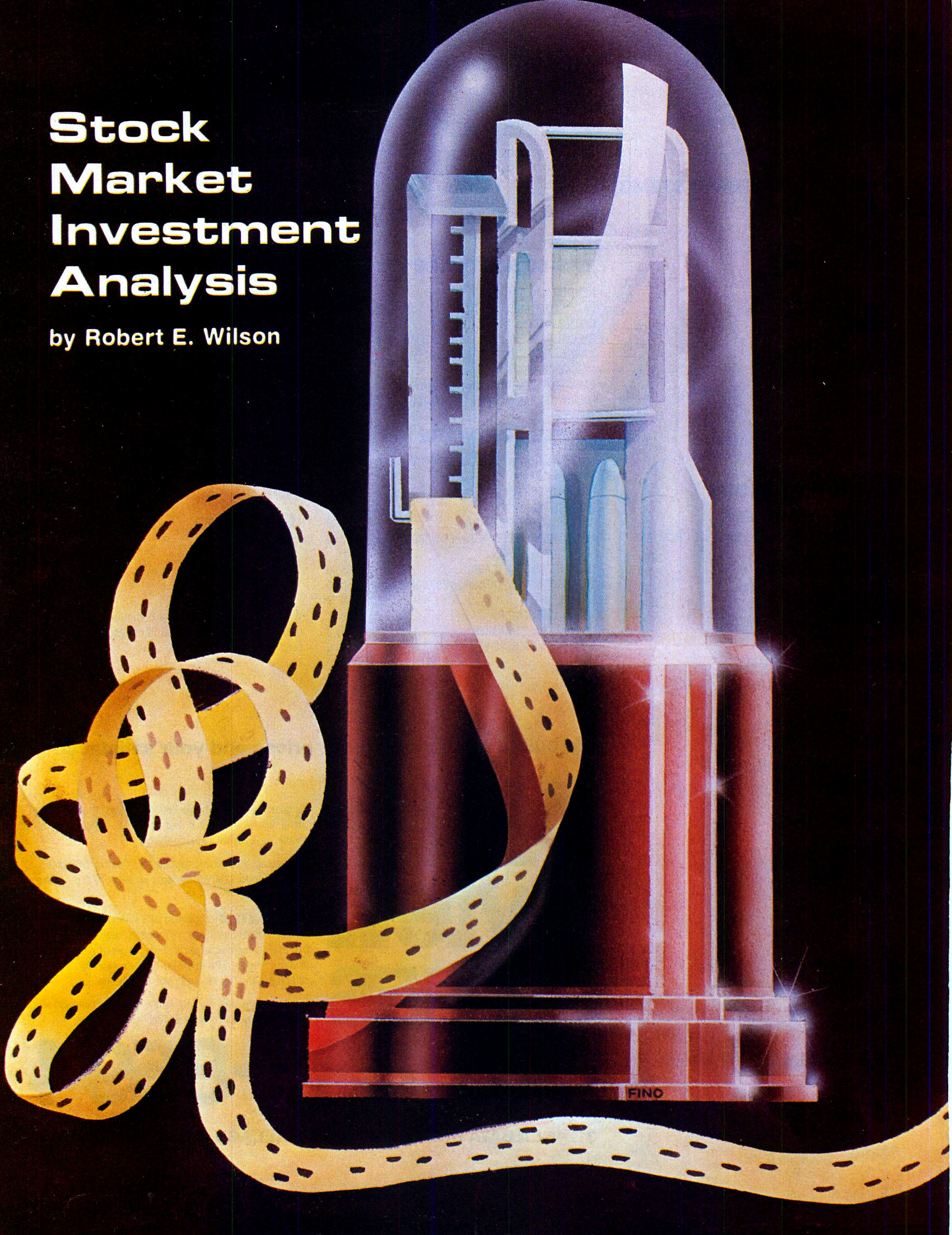
Stock Market Investment Analysis

by Robert E. Wilson



This program is an analysis tool for stock market investments. It calculates the 29-week moving average for up to 40 different stocks, and it will store the data on cassette. Thus only the new prices must be entered each week for an updated set of averages. It is written in level II Basic for the TRS-80 model I, and uses about 14K of memory.

The concept of a moving average is that of picking a number that corresponds to the nominal price of the stock. Comparing the current price to this nominal price shows whether the stock price is rising or falling, and the difference shows the rate of change. The customary nominal price is the average of the last 29 weekly closing prices. It is a moving average, in that each week a new price is added into the average, and the oldest price is deleted. Other period lengths could be used, but 29 weeks are long enough to avoid distortion by short term trends, and still short enough to respond to trend changes.

To use this program reliably, you should reserve five cassettes. Two of them are for the program itself, and are duplicates. One of the program tapes is used for loading each week, and the other is held for recovery, should anything happen to the first. Similarly, three cassettes are used for data, but in a rotating order.

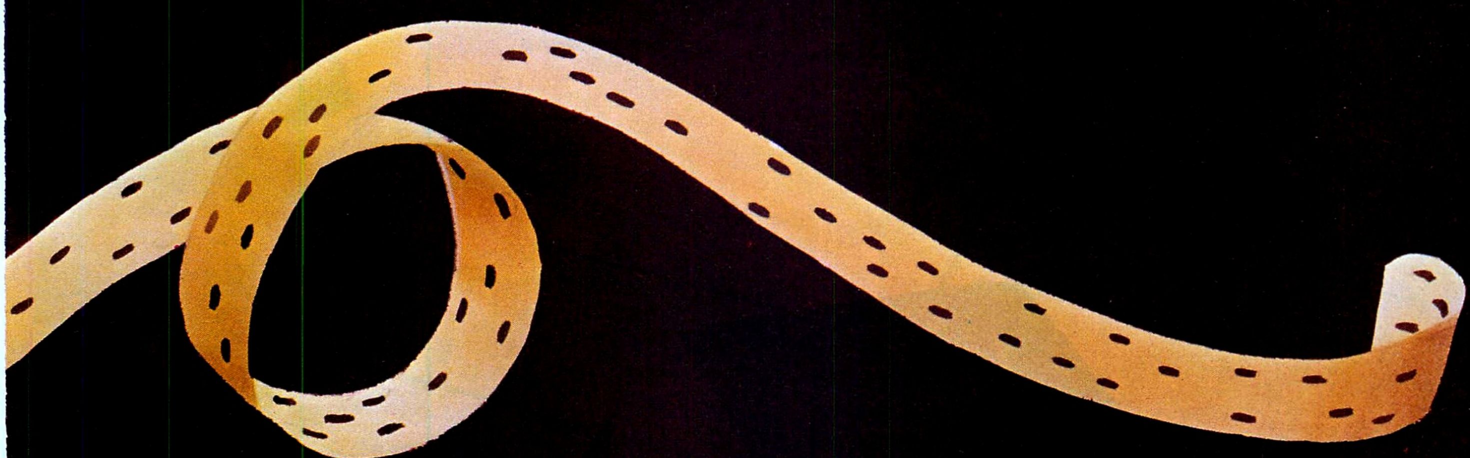
First, read in last week's data from the most recent tape, then remove it from the cassette player and replace it with the oldest tape (from three weeks earlier). After each session, you will have three separate tapes.

To get started, type RUN and the program will announce itself, then clear space in memory for the stock price data. The program will then ask for the current date. You may give it *any* string of six characters; it only saves them for display. It will discard excess characters, or pad up with trailing blanks if there are less than six. Suitable values might be 042780 or perhaps APR-27.

The program will now display a summary/command page. The ticker symbol for each stock, along with the current average are displayed on the upper part of the page. (All will be blank right after loading.) On the lower part is a command menu, and you're ready to go. The following commands are listed in the order in which they will normally be used.

Read Tape (#6). The program will tell you to insert a tape, type YES or Y, and push the ENTER key. (Typing anything else will abort the command.) The cassette must already have a file on it that was previously written by the program. It cannot handle a blank tape or a Basic source file. The program will then read in the data. Reading is performed as a series of short "gulps", so the cassette player will turn on and off, until the whole file has been read. The summary/command page will then return to the display.

Update (#1). The program will replace the summary/command page with a display of all of the prices for the selected stock (in horizontal rows across the screen). It will then ask you for the latest price. Enter the price in dollars and decimals. It does not use eighths or points, rounding off to the nearest penny, and limiting to a maximum of $999.99. After entering the price, the program removes the oldest price, shifts over all of the others, and tucks the new one on at the



If you enter a wrong price, the program will let you do it over by entering a negative number.

end. It will then recalculate the average, and change the record date to the current date. You may enter as many successive prices as you wish. After each one, the program will show you the updated data. To drop back to the summary/command page, type in a zero price. If you enter a wrong price, next enter any negative number, and the program will back up one price step and let you do it over.

Scale Splits (#4). This is needed to compensate in case a stock issue splits its shares. The old prices must all be scaled by the split ratio for future comparisons. The program will display the stock data, then ask for the number of new shares for old. This can be either larger or smaller than one (for combining rather than splitting). After the number is entered, it will recompute the prices, then display them. Enter a negative number or zero to stop and go back to the summary/command page.

Delete (#3). To remove a stock record that you no longer wish to track, enter this command. The program will display the price data, and ask if you are sure that you want to erase it. After confirmation, it will recopy all of the other stock records below it in the file to close up the gap and return to the summary/command page.

Add (#2). The program will ask you what the new ticker symbol will be. Most stocks use a three letter code, but some use four. Any length from 1 to 4 may be used. The program will lop off excess characters, or pad up with trailing blanks as necessary. The new entry will then be inserted in alphabetical order. The program will set the record date to the current one, and ask for the current price, or current average price. It will set all of the price data to this value, and then return to the summary/command page.

Plot (#7). The program will draw a rough plot on the CRT for any selected stock. It will pick a scale factor to the closest $10 increment top and bottom that lies outside the data, plot the data, and draw a line at the average value. It will hold the display for as long as you wish to study it, then return to the summary/command page.

Write Tape (#6). The program asks you to insert the cassette, type YES or Y, and push the ENTER key when you are ready to proceed. (As with reading, typing anything else will abort the command.) It then writes out the file in a series of records, and returns to the summary/command page.

Termination. To stop the program, push the BREAK key. No separate command was needed, as this is provided directly by the TRS-80. Restarting the program with RUN will clear out the memory. If some error condition has dropped you from the program, you may be able to get back to the summary/command page by typing GOTO 440 and the ENTER key. It doesn't always work, but it is worth trying.

The overall structure of the program consists of a short initialization section (see figure), followed by a

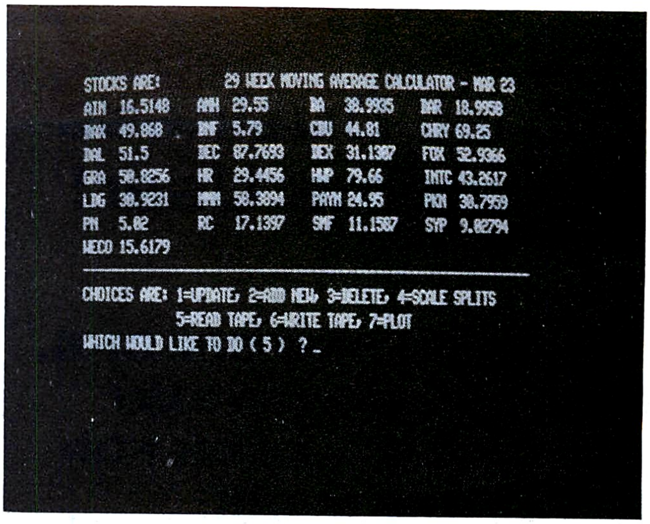


Figure 1. Summary/command page

This is what is presented on the monitor after a data file has been loaded. The command processor remembers the last command executed, and will repeat it without requiring you to reenter the number, unless you want another choice.

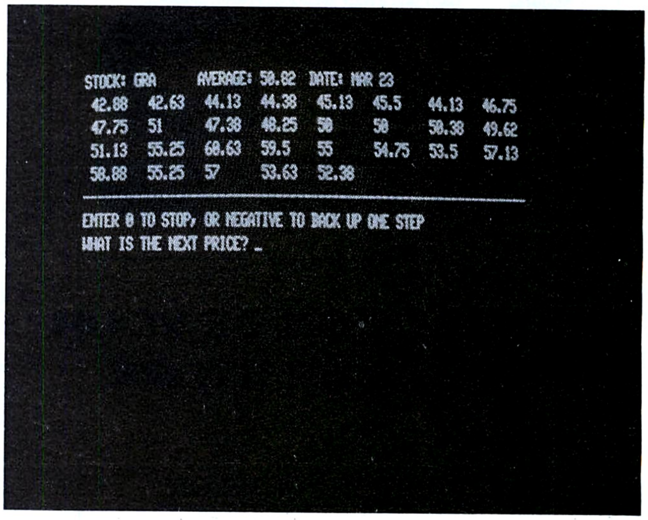


Figure 2. Individual stock price data

This is presented on the video monitor when updating a stock record.

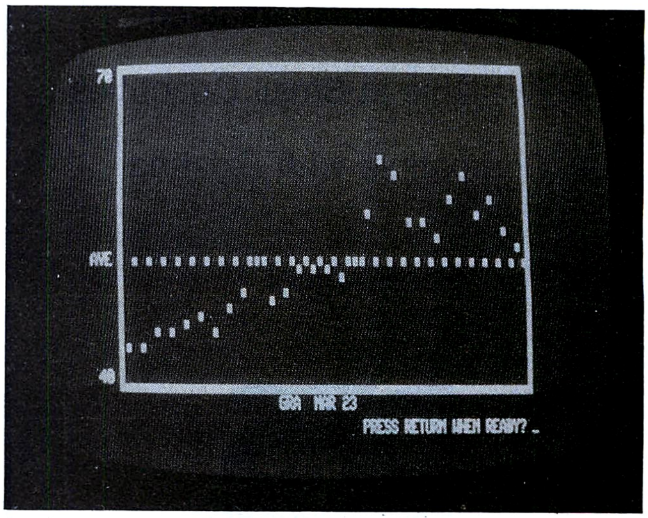


Figure 3. Data plot

This is presented on the video monitor upon request for a plot of the data for an individual stock.

```
60000 REM ROUTINE STATEMENT LOCATION MAP
60010 GOTO 100   : REM MOVING AVERAGE MAIN PROGRAM
60020 GOTO 440   : REM NORMAL REENTRY POINT
60030 GOTO 1000 : REM STOCK UPDATE
60040 GOTO 2000 : REM ADD STOCK
60050 GOTO 3000 : REM DELETE STOCK
60060 GOTO 4000 : REM SCALE SPLITS
60070 GOTO 5000 : REM READ DATA - CASSETTE
60080 GOTO 6000 : REM WRITE DATA - CASSETTE
60090 GOTO 7000 : REM PLOT PRICES
60100 GOTO 8000 : REM FETCH POINTER
60110 GOTO 9000 : REM DISPLAY HEADER
```

Figure 4. Initialization section

main program that makes a series of calls to the function subroutines. This modular structure makes it easier to modify one part without disturbing the others. Statement numbers 60000 through 60110 are added as an internal directory to the location of each subroutine. (Incidently, if you use a renumbering program, this directory will keep itself current with the new locations.)

To change the length of the averaging period, merely change the number given in line 190. This number should be given as one less than the number you want, because the TRS-80 internally considers the number 0 as a starting point rather than 1. This altered program may now be saved on a separate cassette, but you will need to set aside a new set of cassettes, because a program of one period size will not normally be able to read that of another.

Tracking stocks

If you are going to track less than 40 stocks, there is no problem—just leave the others empty. To track more than 40 is equally simple if you just run the program over again with a new set of data tapes, analyzing stocks in groups of 40 at a time. The problem is not memory size, because in a 16K machine, there is about 2K still unused. The problem is display size: 16 lines of 64 characters doesn't leave much room. Line 200 sets the quantity for the whole program. Picking a value that is an even multiple of four would make it easier.

The program may be speeded up by deleting all of the REMarks, and the extra spaces in most of the statements. However, don't do this to your only copy of the program, because it will be very difficult to decode later. This could allow from 5-20% more speed.

The program was originally written for an Exatron stringy floppy tape unit. The added speed of this device is particularly nice for a program that does a lot of data reading and writing. The routines are included in the listing. You may delete the routines for cassette in lines 5000 to 5360 and 6000 to 6220, substituting those from listing 2. You may also reduce the string space request in line 140 down from 768 to 512. A 10-ft. wafer holds the program very nicely, and a 20-ft. wafer holds a 40-stock data file. Thus, loading is accomplished in seconds.□

Program on page 162

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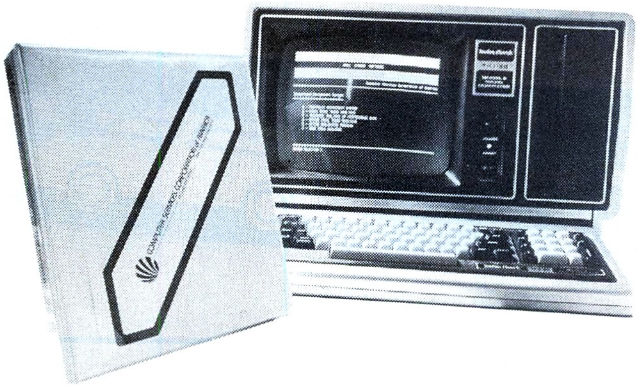

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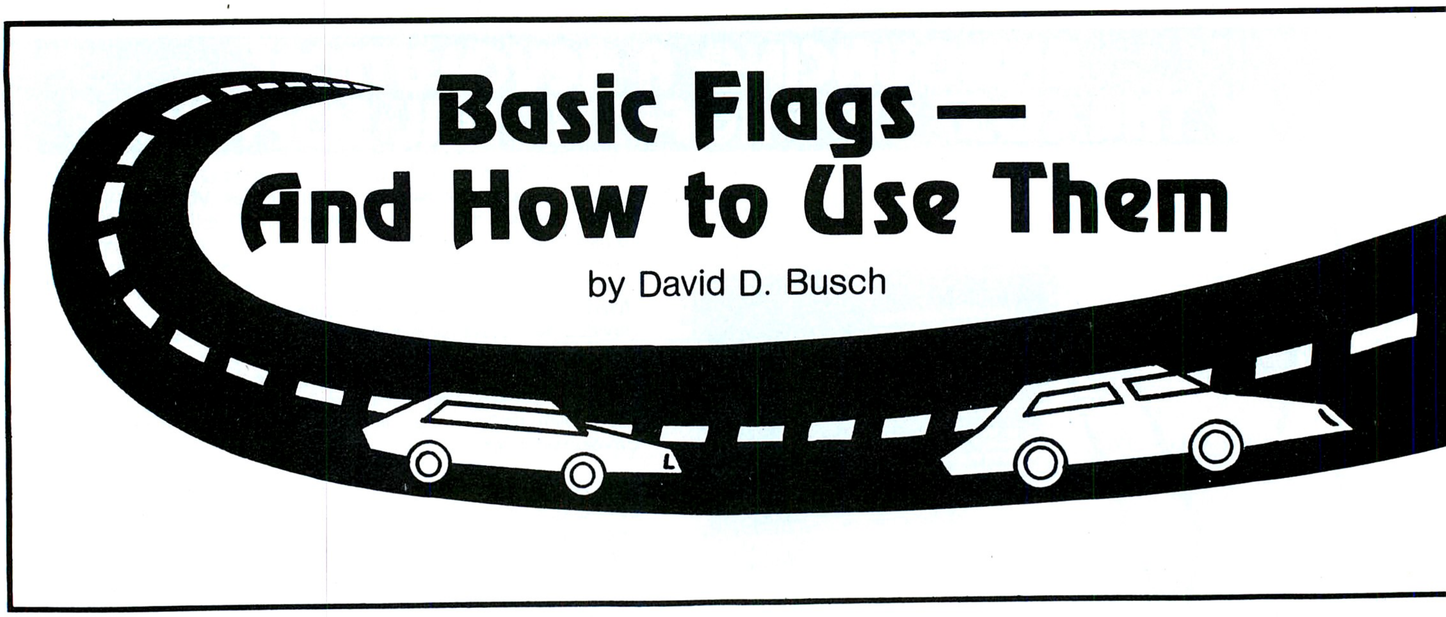


Basic Flags — And How to Use Them

by David D. Busch

Much of the computer's power resides in its ability to test for certain conditions. Once met, these usually allow two possible options. Without IF...THEN..., the most sophisticated microcomputer would be little more than a fancy adding machine.

Even beginning programmers learn to use IF... THEN... statements quite early. These can take many forms: IF ANSWER$ = "Y" GOTO 1000, IF MPG = 30 THEN A = 2, etc. The flag is a special tool. Properly labeled flags can make program logic clearer, even to the original programmer. They can sometimes be a valuable programming shortcut, or even a debugging aid.

In its simplest form, a flag is a variable set to a certain state in order to inform the program that a certain course of action is to be taken rather than another. Frequently, flags are used so that they can have only one of two states—on or off. In keeping with the binary nature of the computer, it is convenient to use a one to signify on and a zero to indicate off. This type of flag is most useful when the IF...THEN... test must be performed a number of times within a program.

As an example, consider the many business and personal programs that offer the user the choice of receiving hard-copy printout, having the results listed to the CRT screen, or a combination of the two. The user may be given this choice in the following manner:

```
100 INPUT"DO YOU WANT A PRINTOUT";AN$:
    IF LEFT$(AN$,1) = "Y" THEN PFLAG = 1
```

In the printout routine later in the program, PRINT and LPRINT statements can be paired to produce either video or video and printer output:

```
1000 FOR N = 1 to 10
1010 PRINT A$(N)
1020 IF PFLAG = 1 THEN LPRINT A$(N)
1030 NEXT N
```

Flags can also alert the program to some special hardware condition that changes how the program works. For example, certain ROM differences between the Radio Shack TRS-80 model I and model III computers must be taken into account even in Basic programs. Software can determine which computer the program is being run on by PEEKing into memory location 293 (decimal). A value of 73 will be returned if the computer is a model III. If a programmer is writing a program that will perform differently when run on model Is or Model IIIs, a CFLAG may be written into the first line of the program:

```
10 CFLAG = PEEK(293)
```

When parts of the program are encountered that can be affected by the differences between the two machines, control can be sent to proper subroutines:

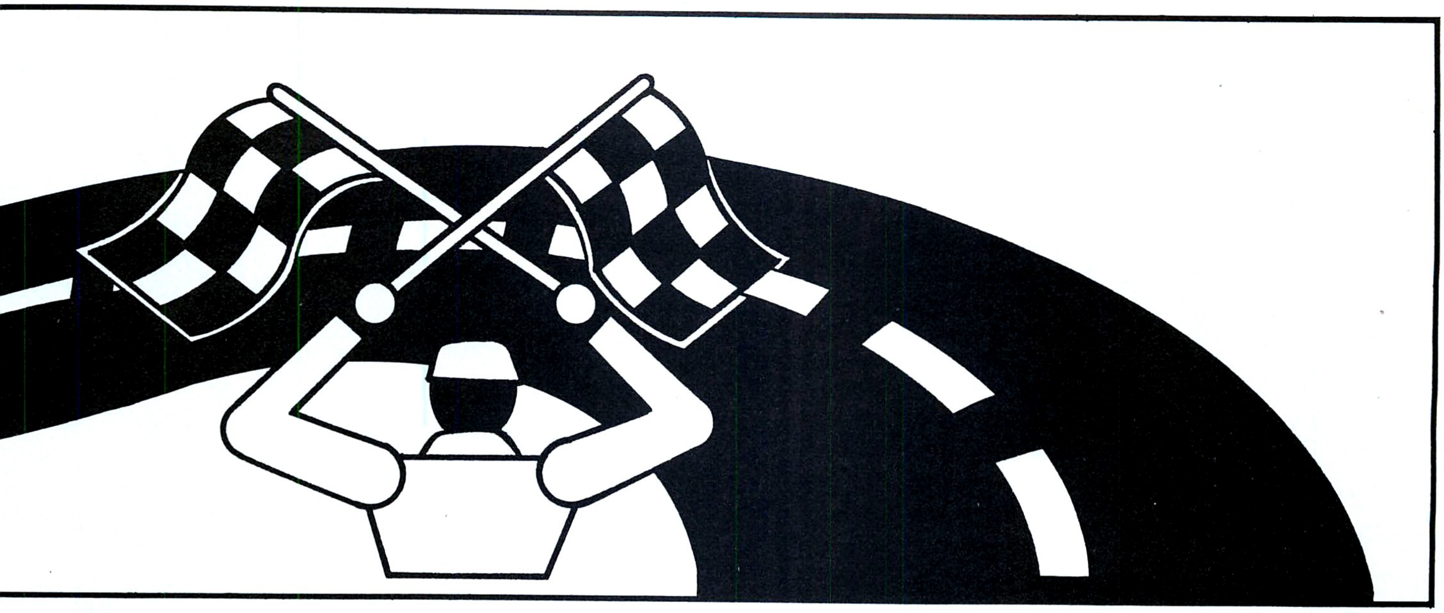
```
1000 IF CFLAG = 73 GOTO 1200
```

Other hardware differences within a given computer can change the programming needed. For example, programs that PEEK at video memory in the model I find different values returned in machines with Radio Shack's lowercase than in those without. If an uppercase A (which has an ASCII code of 65, and may be printed using CHR$(65)) appears in the upper lefthand corner of the CRT screen (decimal 15360 in the video memory), then PEEK(15360) = 1 in a lowercase model I, while PEEK(15360) = 65 in a stock version. A lowercase flag can prevent a crash:

```
10 INPUT"DO YOU HAVE RADIO SHACK'S LOWER
     CASE";AN$
20 IF LEFT$(AN$,1) = "Y" THEN LFLAG = 64
...
...
1000 FOR N = 15360 TO 16000
1010 A = PEEK(N)
1020 IF A<32 THEN A = A + LFLAG
1030 CH(N - 15360) = A
1040 NEXT N
```

In the example above, the program will look at a portion of the video memory, and if A is less than 32 (the characters whose values are changed by the lowercase mod), then LFLAG will be added to the total. Instead of a 1, a 65 will be stored for an uppercase A, a 66 instead of a 2 for B, etc. This change will be made only when LFLAG has been set by the user. Thus the same program can be run with no changes in lower and uppercase machines.

Prudent use of flags can prevent FILE NOT FOUND errors, when disk Basic programs using sequential disk



data files are run for the first time. Such programs frequently load an existing disk file and store its data in a string or numeric array prior to updating and additions. Then, the new file is SAVEd to disk. The only problem with this method is that the first time the program is run, the relevant file does not exist. Those with programming knowledge have no trouble avoiding FILE NOT FOUND. They simply find the disk SAVE routine in the program listing, and, in command mode, type in GOTO xxx, where xxx is the line number of the OPEN, "O",buffernumber,filename module. But unsophisticated users attempting to run such a program for the first time may well be stymied. A flag can initialize the disk file automatically:

```
10 INPUT "HAS THIS PROGRAM BEEN RUN
   BEFORE";AN$
20 IF LEFT$(AN$,1)="Y" THEN FLAG=1
30 IF FLAG=1 GOSUB 1000:GOTO 100
40 '****** LOAD EXISTING FILE FROM DISK ******
50 OPEN "I",1,"DATA"
60 .....
..
..
100 '****** MAIN PROGRAM BEGINS HERE ******
...
1000 OPEN "O",1,"DATA"
....
....
1050 RETURN
```

This example, used for illustration, is somewhat simplified. In fact, because FLAG is used just once, there seems to be little reason to use a FLAG. However, some programs may call for many initializations of one type or another. The beauty of using a flag is that, once the program has been run that first time, the more sophisticated user can delete or bypass with REMs, the "HAS THIS PROGRAM BEEN RUN BEFORE" input. Once removed from the mainstream of the program flow, FLAG will never equal one, and therefore, all of the many initialization subroutines will never be called. This bypassing is accomplished without heavy programming changes. Only one or two lines need to be changed. The extra code later in the program will consume bytes, but waste no user time.

Flags can save time during a program run. A complex data base management program could require accessing a number of sequential disk files at various points during the program run. It would waste both time and memory to load all of these at once if only a few are needed in a specific run. It would also waste time to have to re-load a sequential file every time a piece of data is needed.

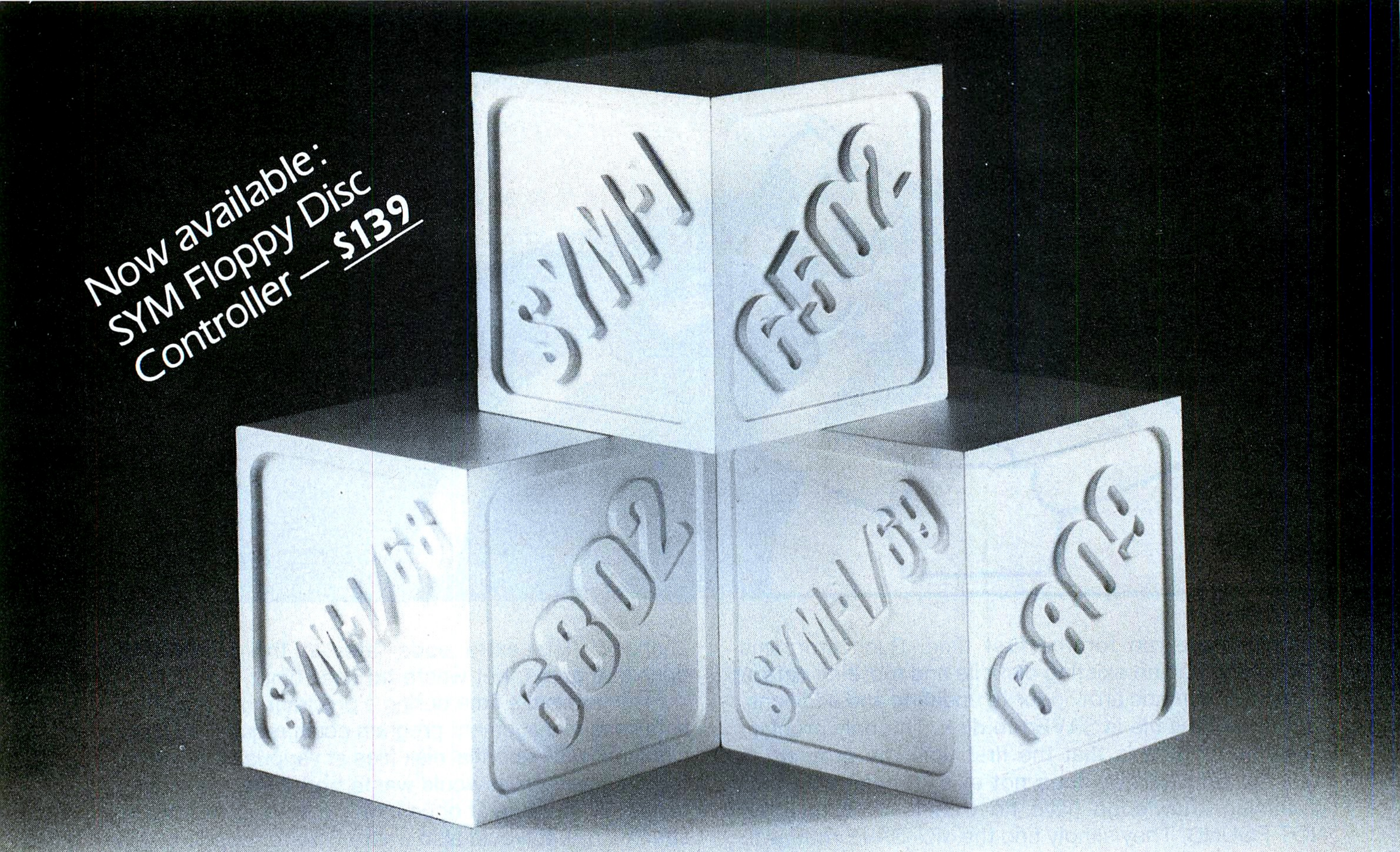
The solution? Create a number of flags that tell whether or not a given file has been read into an appropriate array during that run. These might be called D1FLAG,D2FLAG,D3FLAG, etc. When specific data files are needed, a test of the appropriate flag could either send control to the disk input routine, or on to the "number crunching" portion of the program:

```
1000 IF D1FLAG=1 THEN 1300
1200 OPEN "0",1,"DATA1"
....
....
1300 '****DATA MANIPULATION BEGINS HERE****
```

Prudent use of flags can prevent a careless operator from doing something he or she will regret later. Data base management programs again make a good example. Any data base has to be added to or updated from time to time. For programs using sequential disk files, it is time consuming to write the updated file to disk every time a new piece of information is added or changed. Instead, the programmer may wish to add "SAVE FILE TO DISK" as a menu option, so that the disk file is written only when a particular updating session during the RUN is completed.

While this method gives the operator the option of aborting an input session, and not saving a "spoiled" sequential file, it also makes it possible to "forget" to store the updated information onto disk. Worse, it is possible to accidentally hit the "SAVE" menu choice before the existing file is loaded. In the latter case, an "empty" file will be saved over the older, desired data file.

Enter the handy flag. Insert a DFLAG at the end of the data loading routine, and an SFLAG at the save module. Each should be set to a value of one when that program section is called.



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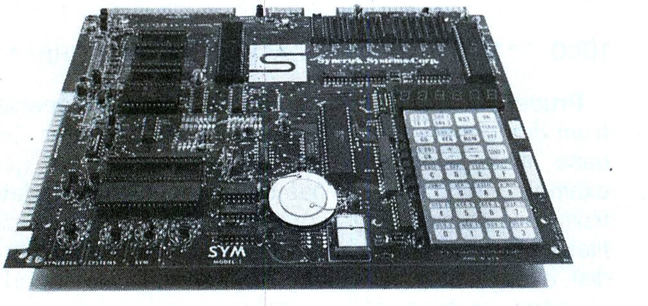

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Other program lines can test for the value of these two flags. If "Save file to disk" is selected, but DFLAG = 0, the program can automatically branch to the disk input routine. If "End Run" is used as a menu choice to terminate all sessions, that section can make sure that SFLAG (set to 1 by disk output, and zeroed again any time new data is input to the file in memory) equals one before ending. Of course, the operator can always terminate a run with BREAK, or by turning off the machine. But even the most foolproof coding can never be idiot-proof.

Though flags can masquerade as ordinary variables, labeling them can help make the program logic clearer. Programmers often find themselves at a loss to explain their own work a few months later, and the outsider attempting to decipher someone else's handiwork needs all the help he or she can get. Flags stand out in a listing to help with debugging and program alterations.

Careful choice of flag nomenclature is important. Basics that allow long variable names can have flag labels describing the function exactly. Even more limited Basics, such as Radio Shack's level II, model III Basic, and Disk Basic allow labeling flags. TRS-80s using the standard language only recognize the first two characters of the variable name, and keywords may not be imbedded. PRINTERFLAG,DATAFLAG, and MEMORYFLAG are not allowed (keywords), while PAYFLAG and PAIDFLAG, though okay, would be seen as a single variable by the interpreter. But DFLAG,PFLAG,MPGFLAG,TYPEFLAG, are all useful labels.

Once the basic flag concept is understood, it's easy to take the next logical step. The use of flags is not confined to IF...THEN... statements. Suppose that an auto expense program is being written that will deal with two different types of cars—leased and purchased. At a certain point, control should be sent either to one set of five subroutines if the car is purchased, and to another set of modules if the car is leased. Assume that this branching is just one of many that differentiate between the two types of cars in the program. The coding might be handled like this:

```
100 INPUT "IS THIS CAR 1.) Leased or
      2.) Purchased";AN
200 IF AN = 1 THEN TYPEFLAG = 0 ELSE
      TYPEFLAG = 5
. . .
. . .
1000 INPUT "WHICH SUBROUTINE SHOULD BE
      ACCESSED (1-5);SR
1100 ON SR + TYPEFLAG GOSUB 1200,1300,1400,
      1500,1600,2200,2300,2400,2500,2600
```

If TYPEFLAG has been set to equal 0 because the car is leased, each time line 1100 is encountered, control will branch to one of the subroutines at lines 1200-1600. If TYPEFLAG = 5, the SR will equal SR plus five, and control will go to one of the subroutines at lines 2200-2600. The same flag can be used throughout the program for other purposes, such as to calculate lease payments vs. depreciation.

What is loosely called a flag here may or may not adhere to the strict computerese definition. What is important is the concept of using IF...THEN... and other Basic statements to enhance the power available to the programmer. □

COMPUTER NETWORKING IN EDUCATION

by Bernard Conrad Cole

There has been considerable interest recently among many large corporations and institutions in local computer network schemes that use sophisticated networking protocols, expensive transmission media and complicated hardware. However, no more than a few hundred have actually been installed.

Meanwhile, working almost unnoticed in an environment of tight finances, literally thousands of teachers and educators have put together low cost local networks of personal computers. They range from two or three sharing the same disk and printer, to sophisticated networks with up to 64 personal computers, as well as interconnected local networks of several hundred.

These local networks range from primitive disk sharing schemes from companies such as Radio Shack and Commodore, to complex Ethernet-like configurations from such companies as Nestar Systems, Palo Alto, CA, and Corvus Systems, San Jose, CA.

Unlike the large computer networks requiring expensive coaxial cable and fiber optic transmission media capable of data rates in the tens of millions of bits a second, these local personal computer networks use inexpensive parallel or serial flat cable or twisted wire transmission schemes and data rates between 240,000 and one million bits per second.

Educational institutions have created one of the largest markets for personal computers. Not only are they a low cost way of introducing computer literacy; they are now fulfilling the long awaited promise of computer aided instruction (CAI) in all grade levels from elementary school through college. Such courses include computer programming, word processing, languages, mathematics, physics, music, sociology and a wide range of repetitive drill and practice skills.

Economic factors

The initial reason educators have been attracted to local network schemes is economics, for they allow the cost of expensive disk and printer peripherals to be shared among a large number of computers. It is also a very inexpensive way for small-to-medium sized educational institutions (such as high schools and community colleges) to build up a computing facility in small step-by-step increments. As a result, such schemes rival minicomputers in computing power.

Very quickly, the non-economic advantages of such local networks of personal computers become obvious: 1) the teacher has the capability of accessing any student's file at any time; 2) the teacher can check a student from a teacher's computer at any time during class, to monitor work in progress; 3) the teacher can put a lesson or message on a hard disk drive and each student can access that message or lesson; 4) the student has access to only his file and cannot enter another student's file; 5) the teacher can keep grade records, using programs that work through the percentages, enabling him to quickly and accurately produce grades for any student at any time; 6) attendance records and reporting are much easier with a computer to assist; and finally, 7) the student cannot damage or lose the data on the hard disk drive.

From the administrator's point of view, the large storage medium, available from the beginning, makes it possible to use the system for student record keeping; for equipment, furniture, and book inventory; for budgeting; for payroll; for club accounting; for word processing; for preparing bids; for scheduling building use either for the community or school itself. The list is endless.

A simple example illustrates the cost advantages of local networks of personal computers. Consider the most common alternative to local area distributed processing: a timeshared minicomputer, a common configuration in large educational institutions. Assume that the minicomputer, including multiple megabyte disk storage, costs $100,000 and that the terminals

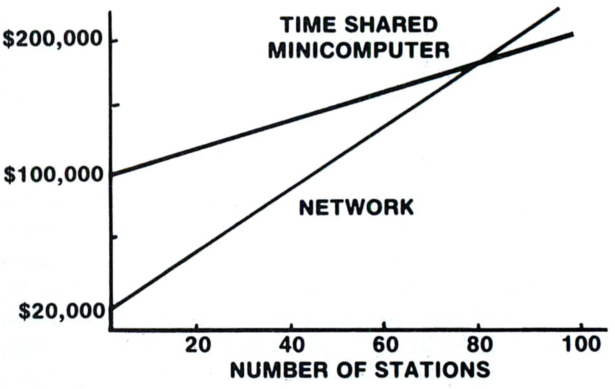


Figure 1. System cost as a function of number of stations

used cost $1,000 each. The processing power of the minicomputer is ten times that of a personal computer.

For "n" user stations, then, the system cost is COST = $100,000 + ($1,000 × n) and the computer power available to each user is POWER = 10 × (P/n), where P is the power equivalent to a personal computer.

For a comparable network of personal computers, the per station cost is $2,000 and a shared file server with disk storage costs $20,000. System cost for n users is COST = $20,000 + ($2,000 × n) and per user computer power is POWER = P.

Figures 1 and 2 show the cost and power of the two systems as a function of the number of user stations. For this comparison, the power per user is greater for the local network whenever the number of stations is greater than 10 and the cost is lower whenever the number of stations is less than 80. For a system with 20 stations, each local network user has twice the computer power for half the cost.

To educational computer users, where budgets are chronically tight, the economics of networking are overwhelming. To meet the needs of these users, a number of companies have entered the market with systems, from simple disk sharing to sophisticated networks of personal computers.

One of the personal computer networking configurations that many educators look at first is Radio Shack's Network in which a model I or model II TRS-80 with one disk drive serves as the master computer, enabling connection of up to 16 TRS-80s, with each saving and loading programs from a central disk.

A teacher can either send a program out to each of the 16 units simultaneously or select which personal computer will receive the program. The student at each station is required to type CLOAD and press ENTER to make the computer think it is receiving a program from a cassette recorder in serial fashion. The drawback to this approach is that the program must be transmitted at cassette recording speed. Later versions of Network allow loading of programs into model IIIs at speeds three times the standard cassette rate. In addition, it is possible to use any CLOADed program with Network, including word processing programs written in assembly language.

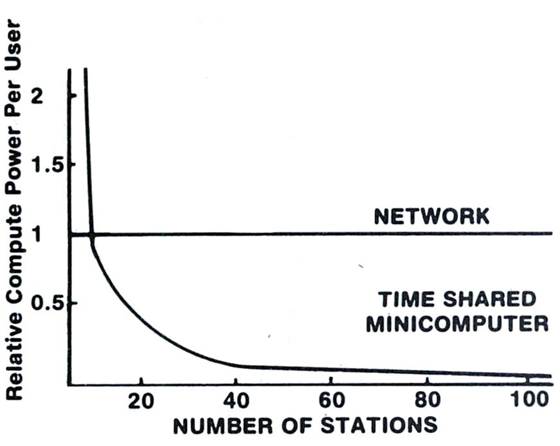


Figure 2. Computer power per station as a function of number of stations

If students want to save their programs, the teacher must tell the network which station is sending. The student then types CSAVE, causing the program to pass onto the disk, also at cassette speed.

A feature of the Commodore Pet that allows multiple units to share the same disk storage is used by some educational institutions to form primitive networks.

Using standard cables, it is possible to plug a number of Pets into a single disk drive. Each Pet hardwired into the drive can access it to save or load programs, but the drive acts as if it were hooked up to just a single Pet. The drawback to this approach is that there are no provisions for handling simultaneous requests or a request that might arrive during the execution of a command.

Handling concurrent commands

A number of schools in the San Francisco Bay area have come up with a straightforward way around this problem. At an installation, a large colored block sits on top of the disk drive. If a student wants to access the disk, he brings it to his station. When the disk task is completed, the block is returned to the top of the disk drive.

A software solution is provided by Skyles Electric, Mountain View, CA, which offers two Pet networking schemes. Providing more system software than Radio Shack's network, the systems can accommodate automatic handling of concurrent commands by a number of different Pets.

Nestar Systems was founded in late 1978 and since then has sold several thousand of its networks, first to the educational market and later to a wide variety of other users.

Nestar's first generation product, the Cluster/One model One, was designed with the educational customer in mind. Its affordability and ease of use for the novice made it an attractive alternative to separate disks and peripherals for each station. Still offered today, the model One was designed to support a wide variety of personal computer configurations—Commodore Pets, TRS-80s and Apple IIs—in the same local network, and incorporates such features as program library sharing and central management through a shared disk.

As part of the network design of the model One, a self-assigning address system was developed, enabling multiple devices to have separate and distinct addresses on a daisy chained parallel bus, by each device implementing an identicial interface. Capable of supporting up to 64 computers, the model One avoided the problems of extra wires or address decoding, but allowed each device to have a unique address on the bus to which it alone responds.

The Cluster/One model A is Nestar's second generation network product. Rather than supporting a variety of different types of personal computers, Nestar has standardized on the Apple II as its basic CPU. The model A network supports up to 65 Apple IIs in a single network. It is aimed not only at the education market, but to a much more diverse user market including banking, travel agencies, public access entertainment, as well as many professional and small business applications.

The network operates over a 16 bit wide parallel bus, and the physical medium is a cable consisting of 16 parallel wires, either in a flat cable or packaged twisted

pairs. This type of cable requires only minimum cost hardware drivers and permits eight times the network throughput of a bit serial cable, since data is sent as eight bits in parallel, or one byte at a time.

The speed chosen for the model A is 240K bits per second, the fastest rate that could be supported by a software driven network interface running on a host computer based on an eight bit processor, such as the 6502 in the Apple II, without large amounts of supporting hardware. This speed easily handles normal network transaction traffic generated by a collection of Apple II computers up to a distance of 1,000 feet.

In the model A network, there is no centralized control. The computers in the network are called stations. Any number of stations operating as "servers" may provide services for other stations, called "clients," on the network.

The network is accessed by a network interface card in each station. Network topology is not restricted; straight bus, star configuration or tree structure are all allowed. To keep costs low, the network interface card does not contain any complex LSI circuitry, such as a microprocessor or custom logic. It consists instead of network bus drivers, RAM buffers and ROM containing the network protocol codes that are executed by the CPU of the Apple II itself in order to access the network. The network cards of all the stations are identical, with the possible exception of different ROM codes to implement the higher level protocols.

Access to the network is implemented as a layered set of protocols. Protocol level 0 is the physical network access. This level is handled by hardware and performs bus allocation, bus contention resolution, address recognition and byte transmission.

Level 1 is packet transmission. At this level, multiple byte packets are reliably sent and received, including error detection and transmission. This level is performed by ROM based firmware in the network interface card.

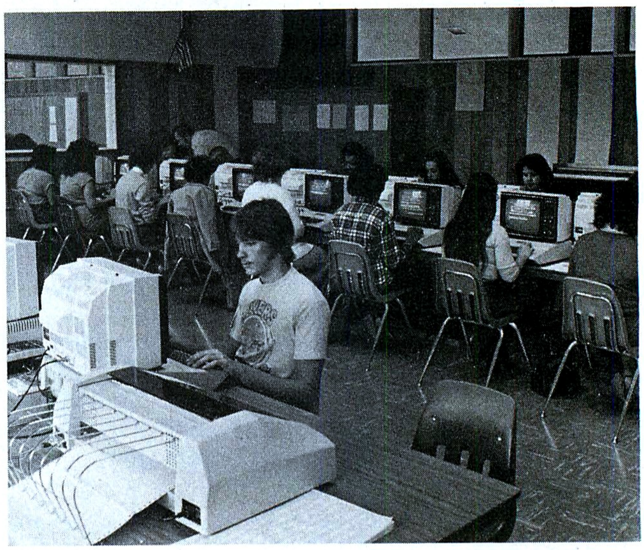
Level 2 is message transmission. Multiple packets may be grouped for interpretation as a single message. At this level for instance, uninterrupted data are passed between the file server and a client station requesting file reads and writes. Level 2 is also generally served by interface card ROM firmware.

Interpreted messages

Level 3 is the process communication level. At this level, the contents of messages are interpreted by disk-based software running on the communication stations.

Stations operating as servers have usually been outfitted with special server function programs, allowing them to provide several direct services to all other stations in the network.

The file server function offers a wide range of storage capacities, from an entry level 1.2M bytes of floppy disk storage to over 4 gigabytes of hard disk storage, more than that available even in many large computer systems. The software accepts file transaction requests from client stations on the network and accesses the mass storage devices accordingly. The file system provided has a hierarchical structure of directories, password protection for individual files and directories, separate protection for user defined public, group and private access rights, interlocks for safe simultaneous file updates and all the other characteristics of a state-of-the-art file system.



Fremont High School, Fremont, CA employs 25 Apple computers under the Corvus installation.

The file server is viewed by its clients as providing two virtual channels, one for file service meta commands and the other for passing I/O requests and data. The metacommands are used for high level manipulation of the file system, such as creating, deleting, mounting and unmounting files, and unlocking shared data during simultaneous updating. The virtual I/O channel is used just like a local disk facility. Because the file server has a dedicated processor, it can implement a superset of the I/O facilities normally provided by the local operating system.

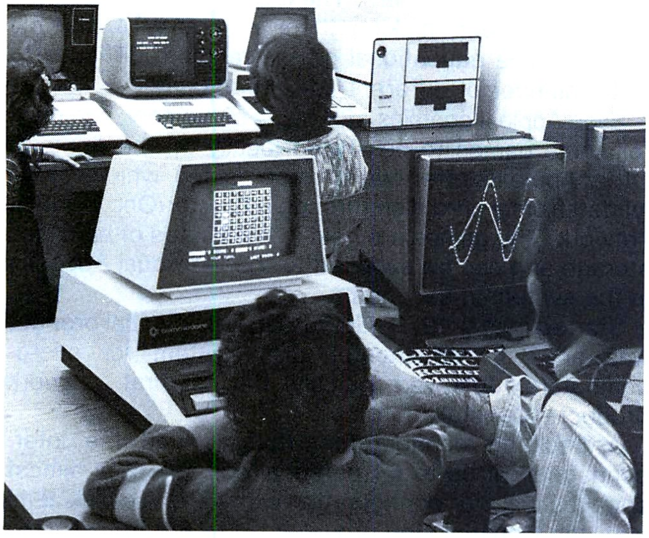
This function is provided by a personal computer serving as a network station with one or more printers attached, running software that accepts print requests from the network and maintains a print request queue on the file server. On request, the print server finds a file on the specified file server and prints it on the specified printer. A typical print server has several printers—one for drafts and listings and another for letter quality final copy.

The 1,000 foot locality limitation of the Cluster/One model A can be easily overcome by using a variety of internet server configurations.

Several types of internet servers, or gateways, are possible. A simple gateway called a file transfer server is an adaptation of the print server and is directly attached to several networks, usually situated in close proximity. It is implemented via a simple board added to one of the Apple IIs which otherwise operates in both networks. Other Apple IIs in either network must go through this Apple II gateway to access Apple IIs in the other networks. The file transfer server fields file transfer requests from each network and transfers files either to its attached printers or to file servers or stations on another network.

For networks not located physically close to each other, long distance inter-network communications is provided by a modem server in one of the Apple II stations containing an autodial/autoanswer modem and data transfer software for internetwork transmission.

Other internet server functions possible with Nestar include a Bisync server that allows a network to access a mainframe using the industry standard 2780 remote job entry work station protocol and a 3270 server that



Classroom setup of Nestar Cluster One/model One devices includes both Pet and Apple II machines.

allows the network to access a mainframe in an interactive terminal configuration.

To create user or server stations, no modifications are necessary to the Apple IIs. Simply by adding the Nestar software and hardware, a standalone Apple II becomes a node in the network, conforming to all protocols of the latest Apple operating system; DOS 3.3 or Pascal OS 1.1. No reprogramming is necessary.

Nestar networks in one form or another have been installed in more than 1,000 locations, most of them in educational installations with anywhere from two or three users to several hundred. These include Norman High School, Norman, OK; Mill Creek Township High School, Erie, PA; and Oglala Sioux College, Rapid City, SD.

The installation planned for the Monterrey Institute of Technology, Monterrey, Mexico, is perhaps one of the largest networks of personal computers to date. Currently Nestar networks are being used to hook the 125 Apple II computers together into local nets and then using gateways to hook the various networks together. Plans are in the works to expand the main campus with an additional 200 or so Apple IIs as well as hook up to the Apple IIs located on the institution's 11 satellite campuses. Ultimately the plan is to obtain 1,000 Apple IIs, all hooked together via local networks.

Arcade setup

One of the most interesting Nestar installations is a Cluster/One model A network located at Sesame Place, an educational amusement park near Philadelphia, PA, sponsored by the Children's Television Workshop. One portion of the park contains computers in an arcade setup. The Apple IIs are all hooked up to a model A to take advantage of the color, graphics and sound capabilities of the Apple II while centralizing the storage of various programs.

Thirty five fully tested games are accessible via 56 Apple II computers, each designed to teach children reading, music, logic, creative writing, social studies and hand/eye coordination. The computers are packaged in special cabinets to make them look more like arcade games than computers. Since most children don't know how to type, special keyboards are used with 1-inch square letters, numbers and special symbols

including color identifiers. The letters are also arranged in A to Z order, making them very easy to use by children. The educational games range in difficulty to suit a number of different age groups.

Each Apple II contains 48K bytes of memory, sufficient for some games to be stored locally on the Apple II. Other Apple IIs offer two or three games, which can be loaded from a hard disk through a Cluster/One model A network. The games are held in 33M bytes of hard disk storage and can be supplied to the individual Apple IIs in the system in seconds.

Started in mid-1979, Corvus Systems' initial product was an 8-in. Winchester disk system for microcomputers, followed quickly by its first network product—Constellation.

A backend configuration that allowed the interconnection of up to 64 personal computers of almost any type in a star configuration with a Corvus disk at its hub, the Constellation provides up to 80 million bytes of shared mass storage with multi-level file and user security, pipes and spooled peripherals.

At the center of the star is a host multiplexer. This central node contains hardware that polls up to eight personal computers in a round-robin fashion. For larger networks, a multiuser system can be set up with one to eight multiplexers, connected to a master multiplexer.

A major advantage of the Constellation is that it allows each personal computer to use its own native operating system without modification. To permit easy interface of virtually any personal computer and/or operating system to the network, I/O drivers are provided for all supported operating systems, including: Apple II, Apple III, Altos, DEC's LSI-11, Superbrain, Tandy TRS-80 models I, II and III, Atari, Commodore, NEC's PC-8000, Zenith's Z89 and generic S-100 bus systems such as Alpha Micro, Cromemco, Dynabyte, Exidy, Imsai, North Star and Vector Graphics.

Corvus' second generation network product, Omninet, was designed to get around the one major drawback of the Constellation: if the multiplexer is faulty, the entire network fails. In addition, the earlier network was dependent on using Corvus hard disks, since the disk controller played a key part in network allocation.

Linking peripherals

Omninet is independent of any disk drive and has no active elements that can fail. It continues to exist and function even after an active element that is connected to it fails. Omninet permits connection of computers to the network and does so even if the computer uses a floppy drive. Using the same networking software as Constellation, Omninet is compatible with the same range of computer configurations. Its main function is as the physical link between all peripherals, whether they are computers or disk drives or printers. A bus oriented system, Omninet allows the interconnection of up to 64 computers and peripherals on a 4,000 foot link with a data transfer rate of one million bits per second.

The method used for physical connection is an RS-422 shielded twisted pair of wires. The transmission over this twisted pair is serial. In the older multiplexer-based Constellation network, transmission is parallel over a flat cable. In serial transmission, only one line is used for both the sending and receiving of a signal. Obviously, one cannot send and receive at the same time or there would be a loss of data. However, the

speed with which signals move over the Omninet is so great that no one computer notices any wait to either send or receive.

Another physical part of the network is the junction box. This junction occurs at the point where the line to the peripheral comes off the network line. The other physical portion of Omninet is the transporter, placed in any peripheral put on the network. The transporter is an interface board that is plugged into each computer. It contains a Motorola 6801 single chip microcontroller, a custom gate array device and associated support components. It acts as the controller and interfaces directly to the serial network and to the memory of the personal computer to which it is interfaced. This direct interface to the host memory is termed direct memory access and means that the data is transmitted from the source directly into the computer's memory without any action on the part of the receiving CPU.

Detecting messages

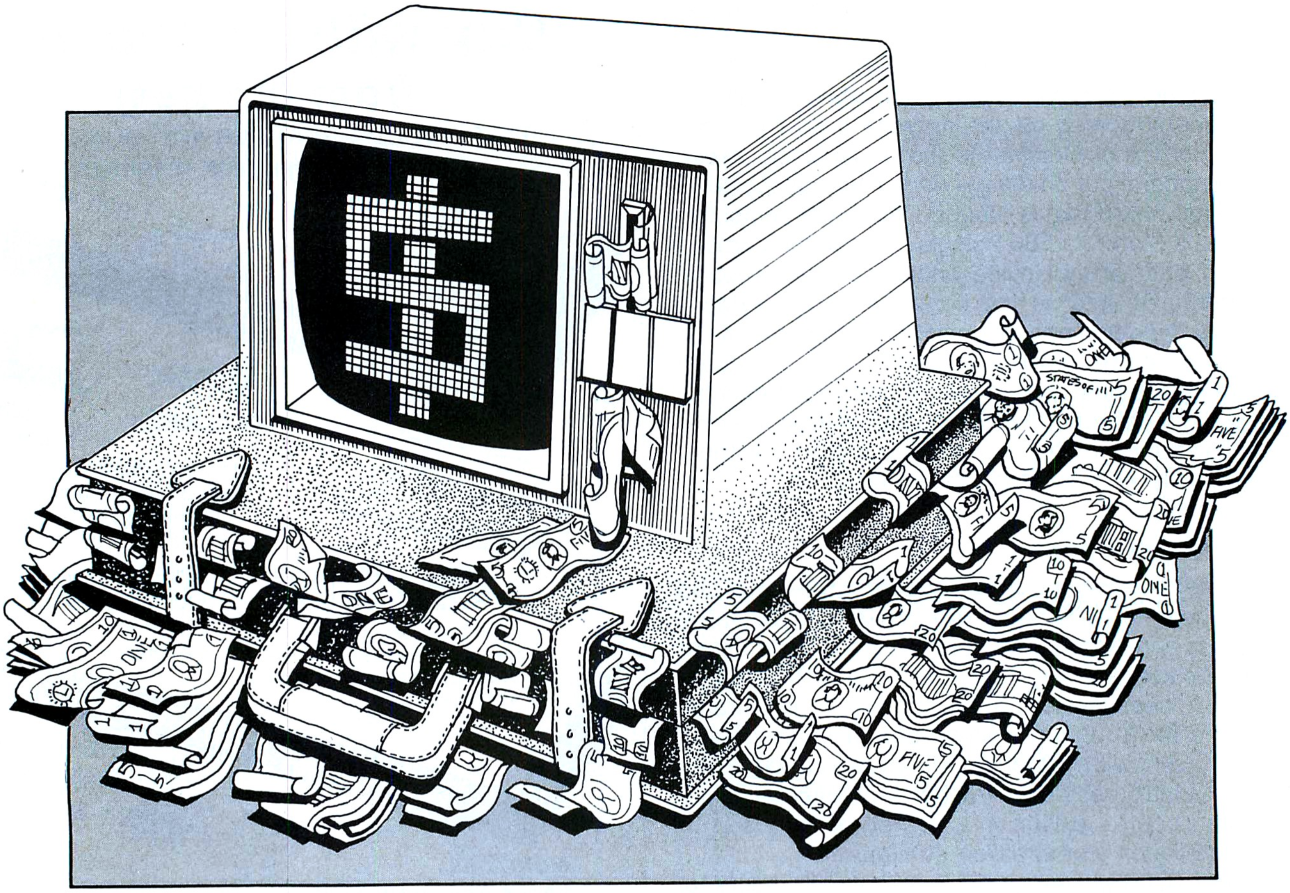
It is the transporter that serializes the data and detects the messages being sent, checks to see if the message is addressed to the station, checks for errors in transmission and senses data on line to prevent collision. If necessary, the transporter does retransmissions after a random waiting period. It sends and receives acknowledgement and filters out duplicate packets. Control resides in each microcomputer. Thus distributed control exists on Omninet, as opposed to the Constellation's centralized configuration.

There exist between 1,000 and 2,000 users of various Corvus network configurations, with anywhere from two to 64 users, including a 25 Apple II network at Fremont Unified School District in Fremont, CA; a 17 Apple II network at Saratoga High School in Saratoga, CA; 25 Apple II network at Springfield High School, Springfield, IL; 36 Apple IIs at Gonzales High School, Gonzales, CA; an eight Apple II configuration at the University of Iowa Department of Education; an eight Apple II network at the University of Miami; a three Apple II system at Washington University, St. Louis, MO; and a three Apple II system at the University of Illinois Institute for Educational Research.

The Saratoga High School installation in the middle of Silicon Valley is a good example of a typical Corvus network configuration, designed to teach programming. The instructor can request beginning programming students to individually load a program from disk, a task completed in seconds. After discussing the program, the teacher gives an assignment to modify the program or write one similar to it. Once completing the assignment, the students save their programs on a hard disk, perhaps for print-out at a later date.

Each student has a password that acts as a key to a particular part of the system. For instance, Pascal programming is not available to everyone and students who wish to do required exercises in math or social science during their free time have passwords to give them access to these programs alone, on a read-only basis.

There is also a publicly known password for anyone who wishes to experiment with the system, learn Basic independently or play games. If the games seem to be taking up too much time, the teacher can easily delete them from the list for that password. The teacher also has access to the programs stored on the hard disk so he can assess the progress of the students. □



COMPUTER PURCHASE: WADE IN EASY

by Lou and Annette Hinshaw

The small businessman of today faces a dilemma: not being able to justify several thousand dollars for a computer system that is more computer than he needs; yet realizing that he will eventually need to computerize in order to compete in the marketplace. But there is a solution: taking steps in increments small enough to chew up and digest as he goes along.

A wise approach is to adopt computers as a hobby. In this way, the small businessman can move into computers with just about any size of investment he wants to make. There are kits and complete small systems for $200-300 that can be used to learn how computers work—and also have the potential for expansion to meet substantial business needs. Of course, a number of more elaborate commercial packages are available in the range of $1,000-1,500 for small-scale hobby use. These require less technical knowledge to use them, but also offer a somewhat smaller learning potential.

The less expensive route usually means having to program in machine language and using your TV for a CRT. The person who goes this route will need to acquire some basic electronics knowledge with the computer, including such building skills as soldering and following wiring instructions. The small businessman may find that the time and knowledge invested in this will improve other areas of his business. Indeed, as more and more machines from automobiles to assembly lines are being improved or run by microprocessors, he may find that this hobby has taught him how to automate parts of his manufacturing process and improve his inventory and ordering techniques. The possibilities are literally infinite.

We started our computer hobby by choosing a Quest kit called the Super Elf. This computer is built around the RCA 1802 microprocessor, which was originally designed for industrial use. This chip has all the potential of the Z-80 and the 6502 and can be used in many industrial applications.

Our first project was the basic board, which is very small. It has only ¼K byte of memory and can be programmed in machine language only. If we had to do it over, we would have included the high and low address options and the deluxe steel case (which has room for an upgraded power supply and an expansion system that can go to 64K bytes). The cost for board, case and addresses is under $200 if you build the kit yourself. The basic board includes a speaker and a video chip, but a separate video modulator is needed between the computer and a TV to generate graphics.

Wiring the basic board took a few hours. It was tedious, but not difficult, as all the ICs are provided with sockets, so one doesn't need to solder them with as much care as if they were wired in directly. Once

everything is soldered in, it is a good idea to go over the whole board with a magnifying glass to look for cold solder joints. We found several when we had put all the ICs in and the board didn't work. It was trickier to correct at this point than it would have been if we had inspected before installing the delicate semiconductor components. We also found that a tool designed to insert and remove ICs is indispensable. Again, when our board didn't work, we checked each chip and found several with bent pins that weren't connecting properly. We got such a tool, removed the ICs, and straightened the pins. Eventually we got it to work.

Two main objectives

The important issues here are twofold: 1) by working with the computer on a parttime, hobby basis, the businessman can build up his knowledge and his computer capacity in small increments of both money and time and avoid committing substantial resources before he has tested and integrated any particular module; 2) by working through a small computer that is too limited to handle complex programs, he is forced to move in small steps, understanding each step before he gets into the next one.

We found that once we had tried all the programs and experiments given in the instruction book that came with our Super Elf, we wanted to try to generate our own programs. Our first attempts were adaptions of programs we had already run successfully. In order to change a program to do something a little different, we had to learn just what each instruction in the 1802 machine language did, and the assembler mnemonics that go with them. Since programming in assembler will allow you to move between several computer machine languages, this increased our computer flexibility.

Because we had so little memory, we couldn't afford to be sloppy. We had to find ways to compact programs and to discover the sequence of commands that would do what we wanted in the fewest number of bytes. For example, we tried to adapt a simple music program to play a piece of sheet music we had. We didn't have enough memory to put the whole piece as a sequence of data. By analysis, we discovered that the tune used only two music themes, but played them in a rather complicated pattern of alternation. We spent days trying to set up counters and loops that would allow the music to be played in the sequence without tripping the earlier or later counters required by the song's pattern. After much frustration, we finally got the program to work. We had acquired important basic knowledge in how to set up counters and loops in machine language. The next programs all came easier.

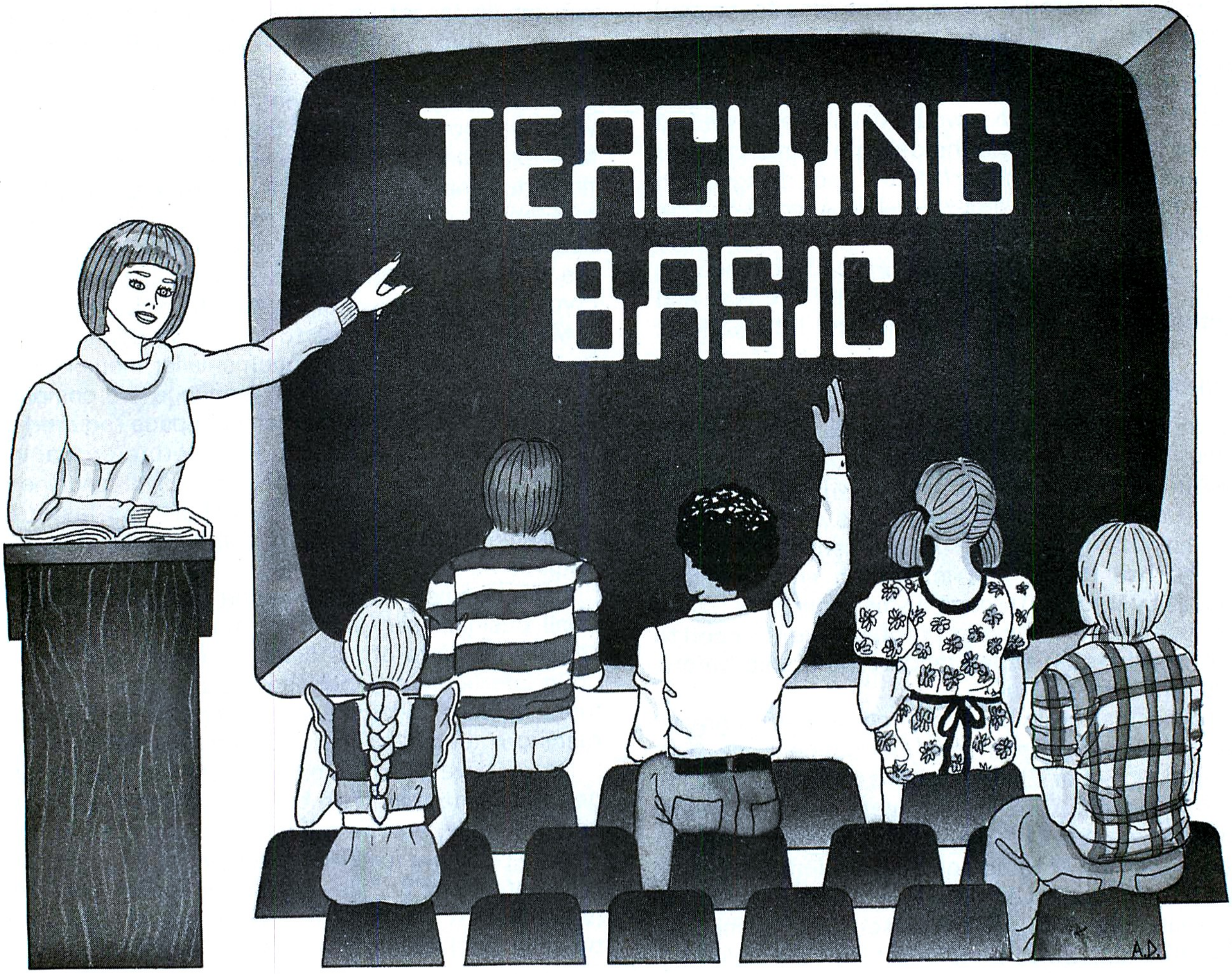
We are now working on graphics, trying to make a dot move across our TV screen. We are gradually plumbing the secrets of how stacks, loops, and input-output processes work. On a parttime hobby basis, we are learning how the basic instructions work and how one puts them into a program. Because we are personally involved in making this computer work, much of the mystery of the machine is dissipated. We have to delve into the fundamentals of how the machine is constructed physically, and what function each byte performs.

As we build our computer system, we will be able to understand each new expansion and peripheral as we add it. We are firmly and steadily moving toward a full computer system, as we chose a microcomputer which can handle almost any feature we are likely to need. As electronic hobbyists, we are already exploring ways to add more memory and other functions via surplus catalogs or by using closeout parts. Even the person who does not wish to take the route of making do with less expensive parts, however, can over a period of time, develop a full computer system that will fill all the foreseeable needs of a small business. This system will cost far less than an analogous turnkey package, and the user will understand it and its capacities more completely than a system he had to digest as a whole.

Moreover, if he learns to handle machine language, he may be able to use a much smaller memory for his needs. Programs in machine language are compacted and do not need the large memory space required for a language such as Basic and the interpreter that interfaces the language and the machine. The machine that works with machine language will also be faster than the same machine using a computer language that requires an interpreter.

Once he understands how the computer works, the small businessman may then find ways to use it to actually do parts of his plant work. Digital-analog and other interfaces now permit voltage, current, temperature, light level, shaftspeed, package counting, address reading and many other computer operations.

He will have a much smaller investment over a longer period of time than if he bought a complete system in one purchase, and he will have a much greater understanding of how to utilize the system he builds to its greatest capacity. He will have added only those features that he actually needs, rather than having bought a package deal that he may never fully utilize. □



by George M. Doss

I have unfortunately heard from more than one teacher, "I have to teach the Basic language beginning next week. What do I do now?" Following is an outline for a six week course on the subject with suggestions on subject matter and structure of the classes. It should provide a vehicle for the teacher to adapt into a lesson plan that best suits his particular needs.

In developing an introduction to Basic, the first step is to examine the parameters of the subject matter. For purposes of this discussion, let's use the 120 plus reserved words of TRS-80 level II Basic as the focal point. These reserved words (keywords) are the alphabet of Basic on TRS-80 computers.

A six week, five-day-a-week, fifty minute course averages about 1,200 minutes of actual class time (after time for a weekly test is subtracted). The first reaction of any teacher with an eye for detail is: "I have to teach about seven reserved words an hour." Rome was not built in a day; neither is the learning of Basic done in 14 hours. Simple programming can be done using about 30 reserved words. In fact, if you were to analyze a general ledger system, these words might represent 80% or more of all the reserved words used in the programs. A recommended list of reserved words can be found in table 1.

Table 1. Recommended reserved words

PRINT, END, =
RUN, LIST, CLEAR, BREAK, NEW
+, −, *, /
CLOAD, LOAD, CSAVE, SAVE
IF THEN, GOTO
FOR TO NEXT STEP
INPUT
READ DATA
GOSUB RETURN
DIM
CLS, SET, RESET, TAB

Table 2. Subject matter categories

1. Key Data Processing Terms
2. Statements
3. Commands
4. Arithmetic Functions
5. Storing/Getting Programs
6. Branching Statements
7. Looping Statements
8. Input Statements
9. READ-DATA Statements
10. Subroutines
11. Single Dimensional Arrays
12. Graphics

Next is an overview of the subject matter. How do we organize the 14 hours? See table 2 for a recommended list of twelve categories. The thirteenth category not listed is probably the most important—using the keyboard. This gives the teacher about 70 minutes for each category.

Third is a possible technique for teaching the subject matter. I have had the opportunity to use Radio Shack's network system in teaching. I was surprised at how much more time was available to demonstrate to the students simple programming using the reserved words in table 1. You can load from a "master" computer into as many as 16 "slave" computers. By placing several students to a computer, they can run the programs, getting instant feedbacks. Also you can let them modify the programs and see what one small change can do to a program. It is recommended that transparencies of the programs be used, so that individual lines can be discussed.

The final consideration is the development of behavioral objectives for the course. Below are twelve simple behavioral objectives that attempt to blend together the reserved words of table 1 with the categories of table 2.

At the end of the course the student should be able to:

1) state in writing definitions for the notions bit, byte, K, RAM and ROM;
2) explain in writing what the concept "statement" is, and to use in a program PRINT, END, and = to direct the activity of the computer;
3) explain in writing what the concept "command" is, and to use RUN, LIST, CLEAR, BREAK and NEW to direct the activity of the computer without programming it;
4) state in writing how the computer handles mixed arithmetic operations, and to use in a program the arithmetic functions of +, −, *, /;
5) use CLOAD and CSAVE if a cassette is available, and if a disk system is also available to use LOAD and SAVE;
6) define in writing conditional and unconditional statements, and to use IF-THEN and GOTO statements in a program;
7) explain in writing the activity of a looping statement, and to use FOR TO NEXT STEP statements in a program;
8) explain in writing the types of variables and how the types of INPUT statement are affected by various types of inputs, and to use INPUT in a program;
9) explain in writing the basic rules for using READ-DATA statements, and to use READ-DATA statements in a program;
10) explain in writing the reasons for the use of subroutines, and to use GOSUB-RETURN statements in a program;
11) explain in writing the function of arrays, and to use in a program DIM and arrays;
12) explain in writing the parameters of graphics and to use in a program CLS, SET, RESET and TAB.

The preceding guidelines represent a broad answer to the question, "What do I do now?" The teacher can carry the plan a step further by writing some simple programs to be used in the class. □

DISPLAYING DATA WITH VERTICAL RASTERING

by Robert R. Lewis

To make the most of the available space on any output display—CRT, printer, teletype—it is often useful to output several columns of tabular data on each line. The natural tendency for ordering this data on most output devices is what may be called "horizontal rastering." This means that successive data items in the array are usually displayed from left to right on a line until that line is filled, after which the device (or, conceptually, the program) sweeps back to the left margin and continues in this fashion until the data is exhausted. An example is shown in figure 1.

X	SINC(X)	X	SINC(X)	X	SINC(X)
0.0	+1.0000	0.1	+0.9836	0.2	+0.9354
0.3	+0.8583	0.4	+0.7568	0.5	+0.6366
0.6	+0.5045	0.7	+0.3678	0.8	+0.2338
0.9	+0.1092	1.0	+0.0000	1.1	-0.0894
1.2	-0.1559	1.3	-0.1980	1.4	-0.2162
1.5	-0.2122	1.6	-0.1892	1.7	-0.1514
1.8	-0.1039	1.9	-0.0517	2.0	-0.0000
2.1	+0.0468	2.2	+0.0850	2.3	+0.1119
2.4	+0.1261	2.5	+0.1273	2.6	+0.1164
2.7	+0.0953	2.8	+0.0668	2.9	+0.0339
3.0	+0.0000	3.1	-0.0317	3.2	-0.0584
3.3	-0.0780	3.4	-0.0890	3.5	-0.0909
3.6	-0.0840	3.7	-0.0695	3.8	-0.0492
3.9	-0.0252	4.0	-0.0000	4.1	+0.0239
4.2	+0.0445	4.3	+0.0598	4.4	+0.0688
4.5	+0.0707	4.6	+0.0658	4.7	+0.0547
4.8	+0.0389	4.9	+0.0200	5.0	+0.0000

Figure 1. Horizontal rastering

Compare the difficulty of finding sinc(x) for a given x in this table with those in figures 2 and 3.

X	SINC(X)	X	SINC(X)	X	SINC(X)
0.0	+1.0000	1.7	-0.1514	3.4	-0.0890
0.1	+0.9836	1.8	-0.1039	3.5	-0.0909
0.2	+0.9354	1.9	-0.0517	3.6	-0.0840
0.3	+0.8583	2.0	-0.0000	3.7	-0.0695
0.4	+0.7568	2.1	+0.0468	3.8	-0.0492
0.5	+0.6366	2.2	+0.0850	3.9	-0.0252
0.6	+0.5045	2.3	+0.1119	4.0	-0.0000
0.7	+0.3678	2.4	+0.1261	4.1	+0.0239
0.8	+0.2338	2.5	+0.1273	4.2	+0.0445
0.9	+0.1092	2.6	+0.1164	4.3	+0.0598
1.0	+0.0000	2.7	+0.0953	4.4	+0.0688
1.1	-0.0894	2.8	+0.0668	4.5	+0.0707
1.2	-0.1559	2.9	+0.0339	4.6	+0.0658
1.3	-0.1980	3.0	+0.0000	4.7	+0.0547
1.4	-0.2162	3.1	-0.0317	4.8	+0.0389
1.5	-0.2122	3.2	-0.0584	4.9	+0.0200
1.6	-0.1892	3.3	-0.0780	5.0	+0.0000

Figure 2. Vertical rastering

Contains the same data as figure 1 but is easier to use. Produced by the Basic program in figure 4.

This is similar to the way most personal computer CRTs and home television sets display information on a hardware level. A beam of electrons that varies in intensity sweeps a series of parallel lines, starting at the top of the tube and moving down. When the electrons strike phosphor elements on the tube face, it causes them to glow.

While this works well for hardware, displaying data for human perusal with horizontal rastering has one substantial problem; it is difficult to read. This is because, in general, fewer data items may be stored in a line than in a column, so the reader's eye may have to go through a number of sweeps before finding the sought-for item. Sweeping is both tiresome and error-prone.

Vertical rastering (figures 2 and 3) is preferable, but it does have its drawbacks. The program must know the total number of data items to be displayed to determine where the column "breakpoints" will be.

Implementing vertical rastering can also be something of a chore. One approach is to copy the data into a two-dimensional array and to display that array with one index being the line and the other being the column. There are several drawbacks to this method; it requires additional storage for the array, it is difficult to change the number of columns, and problems arise when the number of columns is not an integer multiple of the number of items.

A better approach is to use a "lookup table" J(I), so that instead of displaying

X(I) X(I + 1) X(I + 2) . . .

the program displays

X(J(I)) X(J(I + 1)) X(J(I + 2)) . . .

X	SINC(X)	X	SINC(X)	X
0.0	+1.0000	1.1	-0.0894	2.1
0.1	+0.9836	1.2	-0.1559	2.2
0.2	+0.9354	1.3	-0.1980	2.3
0.3	+0.8583	1.4	-0.2162	2.4
0.4	+0.7568	1.5	-0.2122	2.5
0.5	+0.6366	1.6	-0.1892	2.6
0.6	+0.5045	1.7	-0.1514	2.7
0.7	+0.3678	1.8	-0.1039	2.8
0.8	+0.2338	1.9	-0.0517	2.9
0.9	+0.1092	2.0	-0.0000	3.0
1.0	+0.0000			

Figure 3. Vertical rastering

To produce the table in figure 2, this would mean setting

J(1) = 1	J(2) = 18	J(3) = 35
J(4) = 2	J(5) = 19	J(6) = 36
etc.		

The lookup table still requires some additional storage, but not as much as the 2-d array, since the J array may be reset prior to each line output with only the values needed for that line. Some languages (i.e. Basic and Pascal) have flexible enough output statement syntax that a lookup table can be replaced with successive calls to a user-defined function. The following example uses this capability, but the formula presented works with a lookup table as well.

No matter how flexible output is, there is still the problem of finding the value of J(I). One formula that works adequately is: $J(I) = mod(I-1,C) \times [N/C] + min(mod(I-1,C), mod(N,C)) + [(I-1)/C] + 1$, where N is the number of items to be displayed; C is the maximum number of columns; I is the array index $)1 \leqslant I \leqslant N)$; [a] is the "floor" function (= largest integer $\leqslant$ a); mod(a,b) is the modulus (remainder) function ($= a - b \times [a/b]$); and min(a,b) is the smaller of a and b.

Putting this formula in the form of a reusable function or procedure turns out to be very advantageous. It will return the proper value of J, no matter how many columns or items need to be displayed. It may be coded into languages such as Pascal and Fortran almost verbatim.

Following is an example of the function sinc(x) in Pet Basic. We will use this formula to print out a table of the function sinc(x), which is defined as

$$\mathrm{sinc}(x) = \sin(\pi x) / (\pi x).$$

Sinc(x) occurs frequently in electrical engineering. We have chosen it because it's easy to evaluate, but the methods we present will work as well for a list of names and phone numbers, a parts inventory or other items.

The formula was transcribed into Pet Basic and is shown in figure 3. Lines 100-128 open files, declare variables, and print headings. The output arrays X and Y are generated in lines 129-160. Printout takes place in lines 165-230. The code before and including line 230 will vary, depending on the computer as well as the data. The formula, however, which is on lines 1000-1130, should work on any Basic machine.

Note that, in addition to J(I), lines 1000-1130 also return IC (= mod(I = 1,C) + 1), which is the number of the column in which items X(J(I)) and Y(J(I)) appear. In this way, the program knows when the end of the line is reached by testing to see if IC is equal to C. If so, the buffer is flushed with a PRINT statement that does not end with a semicolon (line 200). IC is also used to see if there's anything left to be flushed after the last full line has been printed (line 220).

The table in figure 2 was printed by this program exactly as shown. If fewer or more columns were desired, only one statement (line 120) would need to be changed. The second table was produced by the same program, but with line 120 changed to C = 5.

It should now be clear that vertical rastering of tabular data is, in general, both desirable and easily implemented. One last note: the above formula (and program) put "slack" (what's left over if mod(N,C) is not 0) on the bottom line, left justified. An algorithm to put slack on the right, top justified, is left as an exercise for the reader. □

SINC(X)	X	SINC(X)	X	SINC(X)
+0.0468	3.1	-0.0317	4.1	+0.0239
+0.0850	3.2	-0.0584	4.2	+0.0445
+0.1119	3.3	-0.0780	4.3	+0.0598
+0.1261	3.4	-0.0890	4.4	+0.0688
+0.1273	3.5	-0.0909	4.5	+0.0707
+0.1164	3.6	-0.0840	4.6	+0.0658
+0.0953	3.7	-0.0695	4.7	+0.0547
+0.0668	3.8	-0.0492	4.8	+0.0389
+0.0339	3.9	-0.0252	4.9	+0.0200
+0.0000	4.0	-0.0000	5.0	+0.0000

Produced after changing "C = 3" to "C = 5" in figure 4. Otherwise, the program was identical.

```
100 OPEN1,4,1:OPEN2,4,2:OPEN3,4
105 N=51   :REM = # OF POINTS
110 DIM X(N),Y(N)
111 REM  FORMATS FOR HEADING AND DATA:
112 H$="     X   SINC(X)"
114 F$="   Z.9  SZ.9999"
120 C=3    :REM = # OF COLUMNS
121 REM  PRINT COLUMN HEADINGS
122 FOR I = 1 TO C
124 PRINT#3,H$;
126 NEXT I
128 PRINT#3
129 REM  CALCULATE SINC(X)
130 FOR I = 1 TO N
140 X(I)=(I-1)/10
145 Y(I)=1
150 IF X(I)>0 THEN Y(I)=SIN(π*X(I))/(π*X(I))
160 NEXT I
166 FOR I = 1 TO C
167 PRINT#2,F$;
168 NEXT I
169 PRINT#2
170 FOR I = 1 TO N
180 GOSUB 1000
190 PRINT#1,X(J);Y(J),
200 IF.IC = C THEN PRINT#1
210 NEXT I
220 IF IC <> C THEN PRINT#1
230 END
1000 REM
1001 REM  VERTICAL RASTER INDEX
1002 REM        CALCULATION
1003 REM
1004 REM INPUT:  I(INDEX)
1005 REM         C(NUMBER OF COLUMNS)
1010 REM         N(NUMBER OF ITEMS)
1020 REM
1030 REM OUTPUT: J(VERTICAL RASTER INDEX)
1040 REM         IC(COLUMN NUMBER)
1050 I0=INT((I-1)/C)
1060 I1=I-C*I0-1 :REM = MOD(I-1,C)
1070 I2=INT(N/C)
1080 I3=N-C*I2   :REM = MOD(N,C)
1090 J=I1
1100 IF I3<I1 THEN J=I3
1110 J=J+I1*I2+I0+1
1120 IC=I1+1
1130 RETURN
```

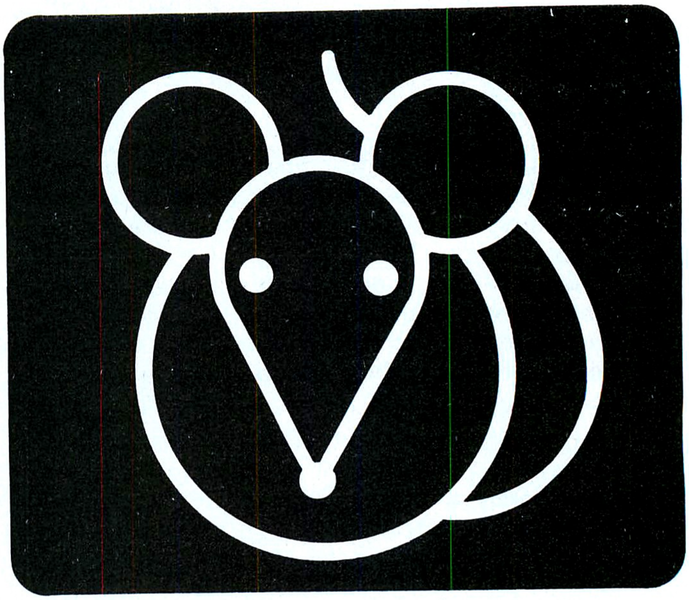
Figure 4. Sample vertical rastering program

Lines 100-230 are a test "driver" for the vertical raster index calculation (1000-1130).

Software Review

Ratfor

Pascal Constructions in Fortran Programs



by Alan R. Miller

Pascal in many ways is the ideal computer language. There are few restrictions on the layout of the source program. Consequently, the program statements can be arranged for maximum clarity. There are several loop structures such as WHILE, FOR, and REPEAT... UNTIL, and there is an IF..THEN..ELSE construction. Furthermore, BEGIN..END blocks can be used anywhere. All user-defined constants and variables must be specifically declared. Extensive checking occurs, so that typographical and logical errors can be readily found.

Unfortunately, there are several disadvantages as well. The biggest problem is that the compiler is very large. This severely restricts the magnitude of the program that can be executed with a microcomputer. Furthermore, double precision and complex types are not part of the language. As presently implemented, most Pascal compilers do not allow function and subroutine names to be passed as parameters to other functions or subroutines. Permanent local variables are not usually implemented either.

Several years ago, B.W. Kernighan and P.J. Plauger proposed an interesting alternative: a preprocessor called Ratfor (for Rational Fortran). The user writes a source program in a language that is similar to Pascal. A Ratfor processor converts the source program into legitimate Fortran statements. Then these Fortran statements are compiled in the usual fashion. Thus the user has the advantage of programming in a structured language, but also can utilize the power of Fortran. Ratfor processors are now available for micros including CP/M and TRSDOS. At 32K bytes, they are about the size of a Fortran compiler.

A big disadvantage of Ratfor is that programs must be compiled twice. But the time saved in writing and debugging programs will generally offset the extra compiling step.

Ratfor source programs are free form, statements can be placed anywhere on the line and may usually continue onto the next line. A # symbol indicates that the remainder of the line is a comment. Thus, comments can be placed on the same line as source code. A % symbol placed at the beginning of a line indicates that the rest of the line is to be passed untouched through the Ratfor translator. This feature can be used for certain Fortran or assembly language statements. It isn't normally necessary for most Fortran statements, however. The Ratfor processor will properly align the corresponding Fortran statements, placing the labels in columns 1-5 and the remainder starting in column 7.

The following keywords are recognized by Ratfor (both upper and lower case):

ascii	if--else
break	include
define	next
do	repeat--until
EOS	string
for	while

In addition, the punctuation:

```
{  }  ;  %  #  <  >  ==  |  !  &
```

has special meaning.

There is a full range of loop control in Ratfor. The DO loop is implemented as in Fortran, except that there is no label at the bottom of the loop. Furthermore, the range of the DO is only the next element. Thus:

```
DO I = 1, N
   A(I) = I
```

is the Ratfor equivalent of the Fortran:

```
   DO 20 I = 1, N
      A(I) = I
20 CONTINUE
```

and will, in fact generate the corresponding instructions. If more than one statement is to be included in the range of the DO, the block of statements is enclosed in a pair of braces. It is customary to place the begin and end braces on separate lines, although this is not required by the Ratfor compiler:

```
DO I = 1, N
   {
     A(I) = I
     B(I) = N - I
   }
```

More general looping, including backward-stepping loops, can be implemented with the Ratfor FOR loop. For example:

```
FOR (I = N; N > 0; I = I - 1)
    SUM = 1 + I * V
```

As with the DO loop, the range of the FOR loop is only the next statement. Therefore, a pair of braces is used to enclose additional statements. The syntax of the FOR loop may seem puzzling. But it is actually very powerful. The parentheses following the FOR statement enclose three items. Any of the three elements may be omitted, but the separating semicolons must be given. The first item is the initialization statement. It corresponds to the first Fortran statement generated by the FOR loop. The second item is the control statement. Looping continues as long as this expression is true. The third expression indicates what action is taken at the conclusion of each loop. In the example shown, the loop runs backwards from I = N to I = 1. The corresponding Fortran statements generated from the Ratfor code are:

```
      I = N
23000 IF(.NOT.(N>0)) GOTO 23001
      SUM = 1 +I * V
      GOTO 23000
23001 CONTINUE
```

The resulting Fortran code appears awkward. But it is not necessary to look at it. The important point is that Fortran DO loops run faster than the equivalent GOTO constructions. Therefore, DO loops should be used when possible.

Two other Ratfor loop-control elements are WHILE and REPEAT--UNTIL. The syntax is:

```
WHILE (logical expression)
  statement
```

and

```
REPEAT
  statement
UNTIL (logical expression)
```

The WHILE loop continues while the logical expression is true. The test for loop termination is performed at the top of the loop. The REPEAT loop continues until the logical expression becomes true. The termination test is made at the bottom of the loop. As with the DO loop and the FOR loop, only one element is affected by these loops. If more than one statement is to be included, a pair of braces is placed around the block. The logical expressions in these constructions are those needed by the Fortran compiler for a logical IF statement. Parentheses are placed around the Ratfor logical expression. Either the Fortran or the Ratfor relational operators may be used in the expression:

Ratfor	Fortran	Meaning
= =	.EQ.	equal
! =	.NE.	not equal
<	.LT.	less than
>	.GT.	greater than
⩽	.LE.	less than or equal
⩾	.GE.	greater than or equal
&	.AND.	and
|	.OR.	or
!	.NOT.	not

Notice that two adjacent equal signs are used in the expression for logical equals.

There is an IF--ELSE statement similar to the one in Pascal except that the word THEN is omitted. The simple form is:

```
IF (logical expression)
   statement
```

where the statement is a single statement or a block of statements surrounded by a pair of braces. The extended form is:

```
IF (logical expression)
  statement1
ELSE
  statement 2
```

The multibranching case statement can be implemented with additional ELSE-IF-ELSE statements:

```
IF      (CHAR = = 'A')
         dothis
ELSE IF (CHAR = = 'B')
        dothat
ELSE IF (CHAR = = 'C')
        dothenext
ELSE
        therest
```

The NEXT and BREAK statements provide additional loop control. When a NEXT statement is encountered in a loop, the remainder of the loop is omitted and control goes to the next iteration of the loop. Loop operation is terminated when the BREAK statement occurs. Some versions of Ratfor accept arguments to NEXT and BREAK. In this case, the expression BREAK 2 causes two levels of nested loops to be terminated. The expression ALL may also be accepted as an argument. BREAK might be combined with an endless REPEAT loop, that is, one without an UNTIL statement:

```
REPEAT
 {
  WRITE(OUT, 101)
  READ(IN, 102) X
  IF (X < -20) BREAK
     . . .
     . . .
 }
STOP
```

Some versions of Ratfor improperly process the NEXT and BREAK commands when they appear in an IF-ELSE construction. For example, the sequence:

```
REPEAT
 {
  IF (A)
    BREAK
  ELSE IF (B)
    DOTHIS
  ELSE DOTHAT
 }
```

will generate two consecutive GOTOs. Since the second GOTO has no label, the Fortran compiler will report a "no-path" error. The solution is straightforward, however. Delete the ELSE after the BREAK so the program will read:

```
REPEAT
 {
```

```
IF (A)
  BREAK
IF (B) # don't need the ELSE
  DOTHIS
ELSE DOTHAT
}
```

The Ratfor DEFINE statement is an ASCII macro replacement feature that does not actually generate any Fortran code. A string of ASCII characters can be associated with a symbolic name. Either or both of two forms may be implemented in a particular Ratfor processor.

```
DEFINE(SYMB,string) or
DEFINE SYMB string
```

DEFINE statements are placed near the top of the program. Then, whenever the expression SYMB appears in the Ratfor program, the corresponding string will be substituted in the resulting Fortran program. Only one DEFINE statement is needed, even though a main program and several subroutines might use the same symbol.

One convenient use for DEFINE is to set the size of arrays in the dimension statement. The three Ratfor expressions:

```
DEFINE(ROW,20)
DEFINE(COL,4)
REAL A(ROW,COL), B(ROW), C(COL),
      WORK(COL,COL)
```

will generate the Fortran code:

```
REAL A(20,4), B(20), C(4), WORK(4,4)
```

Another application for the DEFINE feature is for the definition of the Fortran input and output logical unit numbers. Suppose that input is wanted on logical unit 2 and output is to be on logical unit 3. One way to code this is to define in the main program variables such as IN and OUT for the logical unit numbers. These variables are made global through a COMMON statement. Statements such as:

```
INTEGER IN, OUT
COMMON /INOUT/IN, OUT
```

are placed in the main program and in each subroutine that performs input or output. The values of IN and OUT also have to be defined separately. For example the statements:

```
IN = 2
OUT = 3
```

might appear in the main program. Each input and output statement can be written as:

```
WRITE(OUT, 101) and
READ(IN, 102) LIST
```

This process can be greatly simplified by using the DEFINE feature in Ratfor. The statements:

```
DEFINE(IN,2)
DEFINE(OUT,3)
```

are placed near the top of the Ratfor program. Then, the expressions:

```
WRITE(OUT, 101) and
READ(IN, 102) LIST
```

Listing 1. Ratfor implementation of the Shell Sort

```
#  RATFOR version of Shell sort

      subroutine sort(A, N)

      integer N, I, J, JUMP, J2, J3
      real A(1)

      for(JUMP = N/2; JUMP > 0; JUMP = JUMP/2)
        {
         J2 = N - JUMP
         do J = 1, J2
            {
                for(I = J; I > 0; I = I - JUMP)
                   {
                    J3 = I + JUMP
                    if(A(I) <= A(J3))  break
                    call swap(A(I), A(J3))
                   }
            }   # do
        }  # for
      return
      end
```

Listing 2. Fortran program from the Ratfor processor

```
      SUBROUTINESORT(A,N)
      INTEGERN,I,J,JUMP,J2,J3
      REALA(1)
      CONTINUE
      JUMP=N/2
23000 IF(.NOT.(JUMP.GT.0))GOTO 23002
      J2=N-JUMP
      DO 23003J=1,J2
      CONTINUE
      I=J
23005 IF(.NOT.(I.GT.0))GOTO 23007
      J3=I+JUMP
      IF(.NOT.(A(I).LE.A(J3)))GOTO 23008
      GOTO 23007
23008 CONTINUE
      CALLSWAP(A(I),A(J3))
23006 I=I-JUMP
      GOTO 23005
23007 CONTINUE
23003 CONTINUE
23004 CONTINUE
23001 JUMP=JUMP/2
      GOTO 23000
23002 CONTINUE
      RETURN
      END
```

Figure 3. Direct Fortran implementation of the Shell Sort

```
      SUBROUTINE SORT(A, N)
C
C -- Shell-Metzner sort for vector A
C -- May 19.0,81
C
      INTEGER N, I, J, JUMP, J2, J3
      REAL A(1)
C
      JUMP = N
10    JUMP = JUMP / 2
       IF (JUMP .EQ. 0) GOTO 99
        J2 = N - JUMP
       DO 30 J = 1, J2
15      I = J
20      J3 = I + JUMP
         IF (A(I) .LE. A(J3)) GOTO 30
         CALL SWAP(A(I), A(J3))
         I = I - JUMP
         IF (I .GT. 0) GOTO 20
30     CONTINUE
       GOTO 10
99    RETURN
      END
```

will generate the corresponding Fortran expressions throughout the program:

```
WRITE(3, 101) and
READ(2, 102) LIST
```

without the need for the block COMMON statements.

Yet another use for the INCLUDE feature is to implement conditional compiling. There might be a need for two different versions of a Ratfor program. Those Ratfor statements needed only in version 1 could begin with the symbol V1. Those statements needed only for version 2 could begin with the symbol V2. Near the top of the program, place the statements:

```
DEFINE(V1,  )
DEFINE(V2,#)
```

The Ratfor processor will change all V1 symbols to blanks, so that the remainder of the line will be properly processed. The processor will then change all V2 symbols to the # symbol, so that the remainder of the line will be interpreted as a comment.

The INCLUDE directive is another powerful feature of Ratfor that is also available on the better versions of Basic, Fortran and Pascal. Frequently used subroutines or portions of subroutines can be placed into separate disk files. Then, an INCLUDE directive in the Ratfor program will cause the desired passage to be included in the resulting Fortran code. Suppose that a sorting routine is located in a disk file called SORT.RAT. The expression:

```
INCLUDE SORT.RAT
```

placed in the main Ratfor program will generate the desired Fortran version of the sorting routine.

Ratfor contains both the STRING and the ASCII command. But since standard Fortran does not include a string type, these commands must be used with care. Ratfor may convert characters enclosed in single quotes, for example, the expressions:

```
    DEFINE(MES,'ERROR--') and
101 FORMAT('FILENAME?')
```

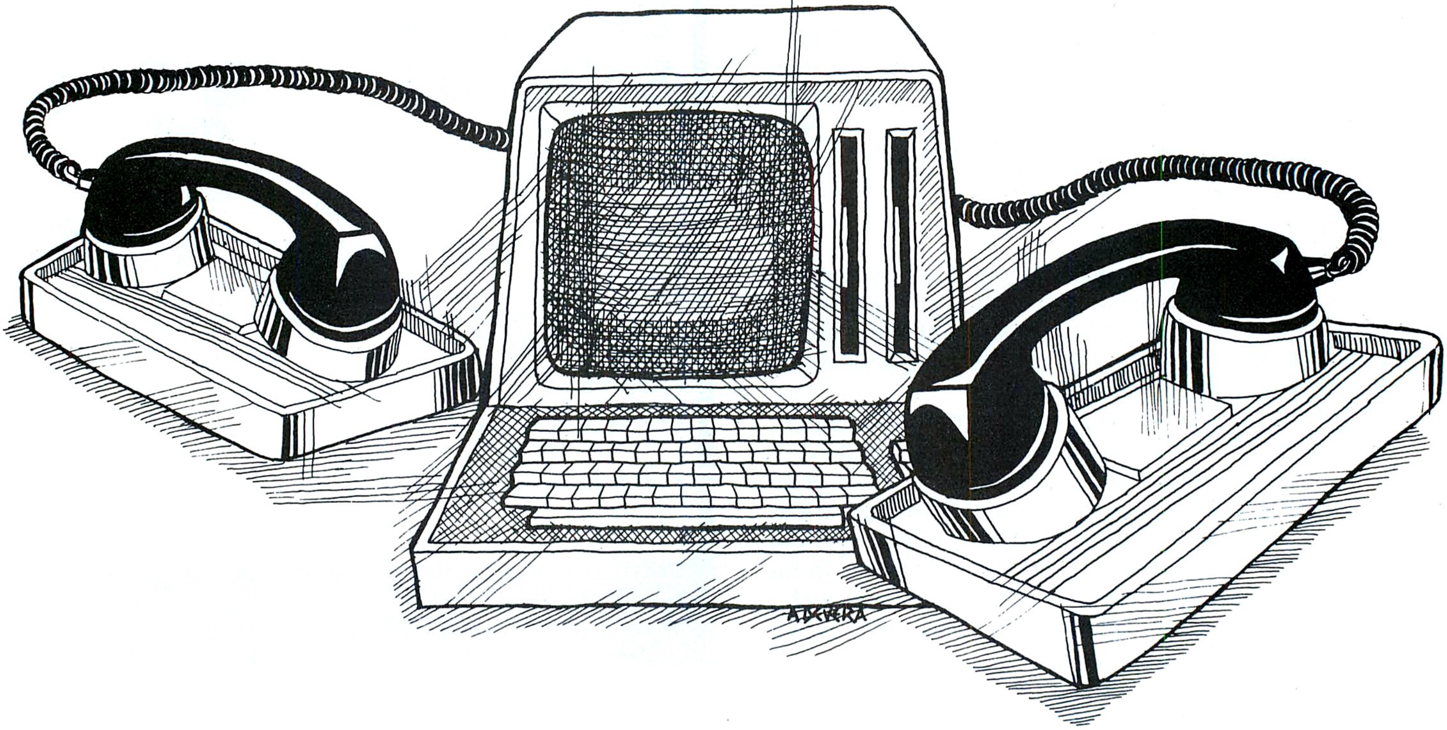
into the equivalent hollerith fields starting with the letter H. Variables can be declared as an ASCII type in the Ratfor program. But these will be converted to one of the legal Fortran types such as INTEGER or LOGICAL depending on the implementation. In any case, it should be possible to handle strings of characters as easily as in Basic.

Listing 1 shows a Ratfor implementation of the Shell-Metzner sorting algorithm. Listing 2 shows the resulting Fortran code generated by the Ratfor processor. Notice the large number of GOTO and CONTINUE statements generated by Ratfor. Listing 3 shows the direct Fortran implementation of this algorithm.

Ratfor processors are available from a number of sources. The CP/M Users Group, New York has two versions. The one on vol 24 runs on the 8080, 8085 and Z-80. The version on vol 49 has more features, but only runs on a Z-80. SuperSoft Associates, Champaign, IL offers a version with its Fortran. A third CP/M version is available from Software-Toolworks, Sherman Oaks, CA. Ratfor for the TRS-80 models I, II and III is available from Soft-Tools, Tijeras, NM. □

CIRCLE INQUIRY NO. 2

THE GENERAL. . .



A Multi-Purpose Communications Program

by Daniel S. Hunt

The requirements were simple. Or were they?

The objective was to couple a low-cost 300-baud modem to the serial port of an S-100 bus microcomputer and write software that would enable it to:

a) Talk as a terminal to a timesharing Univac 1108, and likewise to the PDP 10/11/20 machines of the Micronet timesharing service.

b) Receive and save messages consisting of edited reports and the voluminous output from financial models running on the big mainframes.

c) Transmit and receive text files from a TRS-80 and a Sol-20 in offices 100 miles away.

One of the key problems posed by this project was its generality. Ideal telephone communication from computer to computer, particularly when file transfer is involved, requires a mutual understanding of protocol —i.e., the meaning of control characters, sequences for checking errors, beginning and ending transmission. The only thing standard about the machines above is that they all recognize the ASCII character set. So compromises were in order, or I would have to research and write three or four different programs.

At 300 baud, text file communication is usually error-free, so both a block-transmission protocol and error sum-checking could be omitted from the program without dire results.

With no block protocol, messages could not be passed to disk storage as they were being received. Instead, they would be stored in their entirety in a single large text buffer. Therefore, the amount of text that could be saved to disk from an incoming stream was limited by the space available in RAM. My Sol-20 has 48K of RAM. The CP/M system takes about 6K, leaving 42K for the terminal program and the text buffer.

To maximize space in RAM for the text buffer—or capture buffer as some call it—the most optimal solution would be to use assembly language. It generates fast, tight code. Performing the functions that appear in the Pascal listing, the assembly language equivalent would use approximately 2K, leaving more than 40K for the text buffer. But assembler takes a long time to write and debug, and was inappropriate for a program I would be changing frequently.

Use of a Basic interpreter, a fast way to code any short program quickly, was also ruled out. Interpreter speeds are marginal for 300-baud communication without assembly language subroutines. However, the real argument against an interpreter Basic in this application is its size (11K to 24K in various makes and models), leaving little room for the text buffer.

So, the first effort was coded using the Microsoft Basic compiler. Previous experience had shown that the object file produced with MBasic 5.0 would be from 14K to 16K in length, the bulk of its length due to a large runtime package of standard routines, and routines and error trapping sequences. The compiler produces fast, directly executable code and has all the bit fiddling facilities needed to manipulate computer hardware.

To Basic's disadvantage was its lack of single-character data type, making it difficult to express the structure of a single-character array larger than 255 bytes. A 28K-character capture buffer is most naturally conceived as PACKED ARRAY[0..28671] OF CHAR. The closest you can come to this in Microsoft is an array of STRING, as in DIM CARRAY$(28671). However, such an array will not fit into memory, Basic requires two extra bytes for each element in the array to manipulate strings that are more than one character long.

The quick and dirty solution was to downsize CP/M to 24K and use PEEK and POKE, plus machine specific addresses, to create an array of contiguous single characters in the area above CP/M from 24K to 48K. This had the drawback that the modem/disk terminal program would require its own special CP/M system disk. Use of other software, text editors and programs for local processing of data would require the user to switch disks.

But Basic met my short-term needs and got me on-line while I reworked the program in a language called Pascal/MT 3.2, a CP/M-based subset of Pascal that proved ideally suited for this type of application.

Pascal/MT provides most of the data types and control structures available in the Jensen & Wirth definition of Pascal, and adds extensions that greatly increase the programmer's ability to confront the machine as a machine.

Extensions of particular use in coding the General included the ability to use an integer as a pointer to a hardware machine address, move data to and from that address by reference to some pointer, and to and from an appropriate abstract Pascal structure (the aforementioned PACKED ARRAY[1..N] OF CHAR).

Also important were the extensions allowing direct access of machine keyboard and serial ports; direct calls to built-in CP/M operating system functions; and Pascal/MT's ability to do bit-wise logic, over and above the Boolean operations available in standard Pascal. PMT's EXTERNAL procedure facility, which may be used to make calls by parameter to a machine address, was used for serial port output; the external procedure in this case is GOBDOS (line 51), which CP/M users will recognize as a BDOS call to output a character.

The result of the Pascal effort is seen in the listing here. The object code occupies only 8K, leaving ample room for the text capture buffer in 32K or larger CP/M systems. The program runs in a fully-sized CP/M, allowing the operator to quickly switch back and forth from the terminal program and other software.

With the exception of specific hardware addressing, screen and file I/O, buffering of data, and communications protocol (or lack of it), all terminal emulation programs operate in a standard way. The General is no exception.

It cycles in an infinite loop, racing back and forth between the keyboard and serial status ports to see whether the inside guy (line 460) or the outside guy (line 442) wants to talk. If either port shows there is data ready, the program leaves the loop long enough to get a single character from the appropriate data port and test it to decide what should be done next.

The main program block beginning at line 439 offers a broad view of the loop and the available alternatives.

If the message is from the outside, the character is fetched form the serial data port (line 444) and printed on the screen, unless it is a linefeed, which is stripped to avoid redundant empty lines.

If the character is an XON signal (line 448), this diverts program control immediately to PROCEDURE RECFILE to hold incoming text in the capture buffer.

If the keyboard tests ready (line 460), the character is fetched (line 462) and evaluated for one of eight possible situations (lines 463-473). Seven of the situations involve control characters used by the operator to manually invoke off-line procedures. These include exiting the program, displaying a status panel, initializing linefeed insertion, full/half duplex screen and other switches, sending a disk file to the modem, capturing text from the modem into the buffer, storing the text buffer, storing the text buffer in a disk file, and erasing/resetting the buffer.

There is no magic to the choice of these particular control characters—A,E,F,G,P,Z—other than that they do not conflict with most commonly keyed terminal signals such as CTRL-S, CTRL-Q or CTRL-C. They may be changed to meet your special needs. If the key struck does not include one of these special characters, the character is sent to the modem for transmission (line 474).

Upon invoking the General from CP/M mode, you are led through an initialization routine (line 351). If you decline the standard settings (line 355), you must reset several option switches. The first Boolean switch, ECHO, allows the video display to operate either in half- or full-duplex environments, independent of hardware settings. AUTOLINE determines whether a linefeed will be inserted following transfer of a carriage return into the text buffer. This is needed because some computers, like the TRS-80, don't use a linefeed, but only a carriage return. So linefeeds must be inserted (line 280) to produce CP/M-compatible text files.

A third switch, held in the Boolean variable AUTOCAP, allows you to determine whether the capture routine, PROCEDURE RECFILE, may be controlled by another machine or local control. If set TRUE, AUTOCAP also observes the same protocol when you are sending files, preceding file transfer with a start character (line 228). The start and stop characters are initialized (line 363) in the listing as XON and XOFF, and you will be prompted to reset these also. You may invoke the initialization routine at any time by typing CTRL-E.

At the end of initialization, PROCEDURE DISPLAY (line 392) shows buffer size, space remaining in buffer, status of the Boolean switches, plus the decimal values of the start and stop characters.

The treatment of PROCEDURE RECFILE (line 251) bears mentioning for its simplicity of execution in Pascal. The capture buffer is declared as a packed 28K array of characters. Pascal puts these characters in adjacent memory locations to maximize the use of memory. You may change the size of the array by modifying only one constant at the top of the listing,

```
term880

* BUFFER is set! *
------------------------------------------
        Modem/Disk Terminal For CPM Users
------------------------------------------

                        Default protocol?N
                        Echo to screen? Y
                        Provide linefeed? N
                        Automatic capture? Y

ENTER automatic capture START character
ENTER automatic capture STOP character

-----
```

Figure 1. On entering the General from CP/M, an initialization routine gives the user the option to go with default settings, or reset CRT echo, linefeed insert, and start/stop protocols for external control of text capture.

MBUFSIZE (line 19), and thus downsize the program to fit a 32K machine (a 12K buffer) or boost it to 64K (a 48K buffer) specs.

The target position into which characters are placed in that array is tracked by PTR, a subscript to the array. PTR is a parameter corresponding to MAINPTR in the main program. It was treated this way to highlight the relationship and make it easier to understand when you come back to modify or maintain the program. The pointer retains its last setting until zeroed. This allows the user to retain more than one message group and not have to save the buffer on disk in between each message.

Not implemented is a method to enable the save buffer to capture data while you remain in the interactive mode. The capture would occur both on send and receive. This would be useful for maintaining a "trail" on a keyboard/modem session for later reference. One possibility for application would be to maintain a history on operator messages sent via electronic mail. Another would be during a session with a timesharing service, where not holding data sent and received could require you to rerun a portion of a program. This is why hard-copy terminals will remain popular in timesharing applications. Rerunning programs just to look up a piece of old data is an expensive habit!

PROCEDURE SENDFILE (line 186) is straightforward with no tricks. The file is specified, opened and sent in an unbuffered stream direct to the modem. It requires that the receiver be in a position to pay your machine full attention, because there is nothing in the outside world that will stop the transmission. You should be aware that most time-sharing mainframes are not set up to receive uninterrupted long messages. They must talk to the outside world in short bursts to avoid tying up the CPU and communications channels. Therefore SENDFILE's usefulness is restricted to communications between single-user stations. To modify it to a specific timesharing protocol, add a routine to test the serial input status port for interrupts and go-aheads from the receiving mainframe.

What are those mainframe signals? You'll have to ask a technical type at the service to which you'll be communicating. The information will not be so easy to obtain, as most sales reps at these services are not well briefed on software/hardware interface problems. When I tried as a subscriber to get downloading protocols from Micronet, I was put off with the answer that the information was "proprietary", hardly the type of answer that promotes enthusiastic use of their admittedly excellent service.

Next comes the save function. Typing CTRL-P obtains PROCEDURE PUTFILE (line 305), which transfers the contents of the text buffer to a disk file named by the user. PUTFILE uses function NOTAFILE (line 98), to make sure that you aren't naming an existing file. But it doesn't stop there. It will automatically create a file called AUTOFILE.A and save your buffer there, rather than letting you overwrite the file already on disk (line 323). If AUTOFILE.A exists also, the "A" after the period is incremented to "B", then "C", etc., until a non-existing filename is created. If you are in a real hurry and don't have time to enter a filename, you may go directly to this default series by striking the carriage return when prompted for the filename. This routine eases the pressure sometimes found in time-sharing work, by shortening off-line time consumed as read/write operations take place.

Reducing off-line time was also the concern in both PUTFILE and SENDFILE. These procedures use Pascal/MT blockread and blockwrite functions to move the standard 128-byte CP/M file buffer to and from the disk. While the Pascal/MT library offers a sophisticated group of library procedures for byte-by-byte file access, the cruder blockmove algorithm used here is faster by a factor of two. The speed is almost startling for those used to Basic interpreter file access times.

How do you get the General to run on your computer? First you need a CP/M operating system and the 3.2 or later version of Pascal/MT. An alternative is to take the concept and recode it in another Pascal, translating the MT extensions into the new language. My translation to UCSD Pascal involved not too many changes, although I had to use the Adaptable Assembler to create routines to access I/O ports, as the unitread/write extensions of UCSD Pascal did not perform as defined on my machine.

Then you must replace some items in the program so that they match your hardware. These include the

```
-------------------- COMMANDS/FILENAMES --------------------
CTRL-A will obtain this display.
CTRL-E set echo, linefeed mode.   CTRL-Z, sets buffer.
ESC quits. CTRL..F sends file,G receives file,P puts file.

-------------------- TERMINAL STATUS --------------------
Text buffer size  =     28672
Space remaining   =     28416
Keyboard echo           is INACTIVE
Linefeed insert         is ACTIVE
Automatic capture       is ACTIVE
Start char = 17         End char = 19
---------------------------------------------------------
 The GENERAL is in keyboard/modem mode:
?>
```

Figure 2. Status display for the General. It may be called by the operator to refer to commands, or check status of the buffer and optional terminal settings.

constants KEYSTAT and SERSTAT (line 15), which are keyboard and serial status ports, and KEYDATA and SERDATA, the corresponding ports from which you get data. You must also change the constants that mask and reveal the setting of bits in the status ports.

If your system is properly documented, the manuals should tell you which masks and routines will have to be changed. Consideration of this difference may cause you to modify the two procedures that test bits at the status ports for KEYPRESSED (line 75) and for DATAREADY (line 90). Two different methods of masking available in Pascal/MT are shown in these routines. A standard Pascal test is made in DATAREADY to test bit 6. It masks bit 6 by ANDing it with 40H. But in KEYPRESSED, the Pascal/MT extension called TSTBIT is used to do the same thing, and reveals the process to the user more clearly than the corresponding ODD(ORD(INCHAR)), since TSTBIT explicitly deals with the bit position number as a parameter.

The sending routines do not have to be tailored to your machine, as they use the CP/M operating system for interface to the outside. If your CP/M uses the logical PUN device for serial I/O to the modem, the program will work with no change.

There are two instances of hardware-specific screen handling in the General. One is CLEARSCREEN (line 54). The statement, WRITE(CHR(11)), may be changed to reflect your own screen clearing conventions. The one shown here is for the SOL/VDM.

The second one, READSTR (line 106), is a variation of a TTY-type Pascal/MT library routine to accept and/or delete an input string. This version has been improved to allow character-by-character deletion, and uses the SOL-20 control-A (left arrow) to rub a deleted character from the screen.

NAMEPARSER (line 142) is a library routine that converts the edited string into an FCB-formatted filename, which in turn is moved to the proper point in memory where it will be scanned by CP/M to achieve file access. This routine calls the function UCASE (line 59) in order to prevent an accumulation of lower case names in the directory. CP/M won't tamper with lower case file names, and therefore cannot be used by itself to delete such a file. UCASE works exactly like the UCASE statement in CBasic. I find much use for the routine, particularly in console work. It eliminates the extra code to trap both upper and lower character versions of a response, as in:

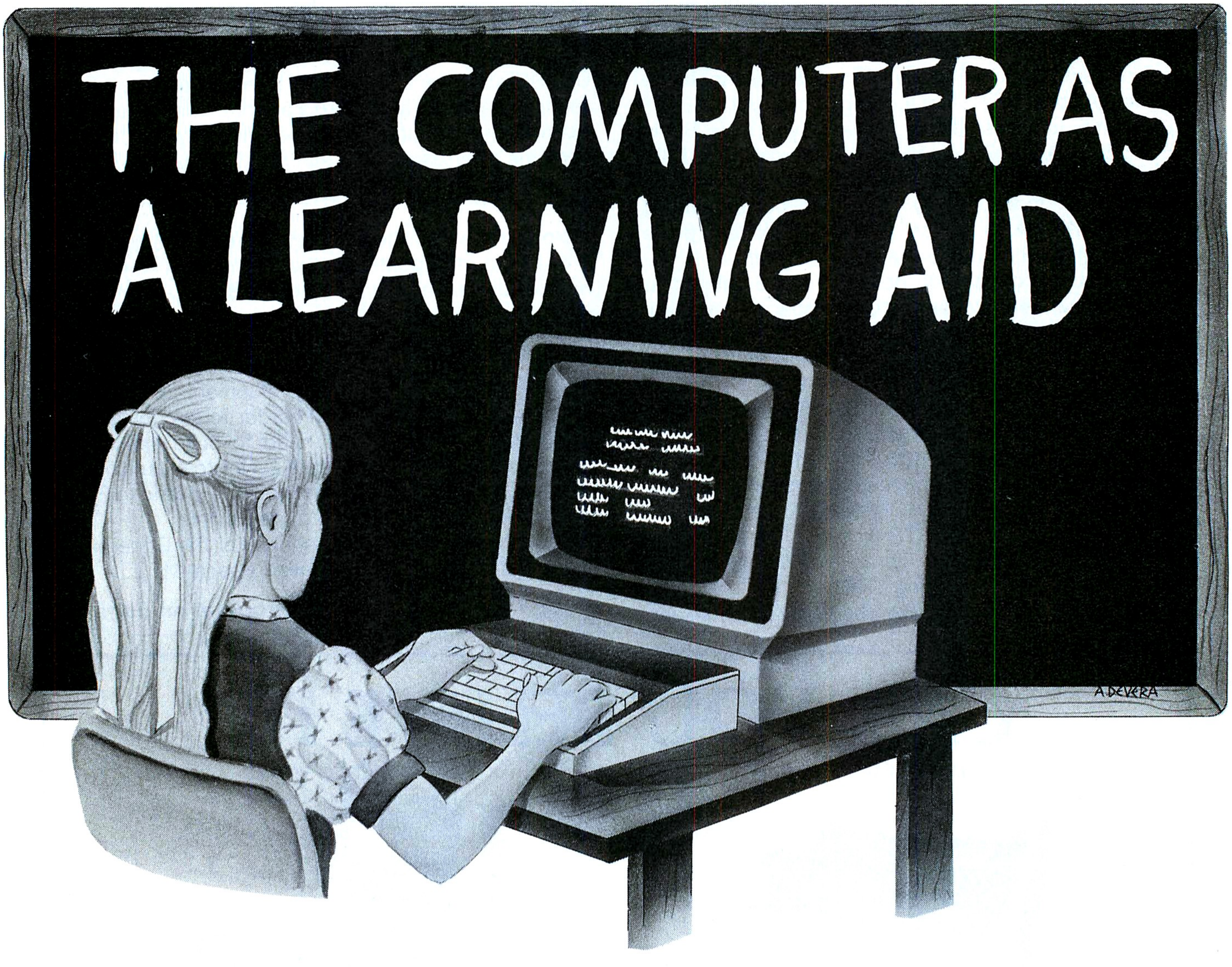
If (ch = 'Y') or (ch = 'y') then ... etc.

You'll note that the General is presented as version 1.4, the fourth update of a base design. The changes have been made mainly to add features, such as the alternate file naming routine and the edited string routine, rather than the fix bugs. Such improvements might not have been as easy to integrate into the program structure, had the developments continued in Basic. While Pascal makes it harder to get going with a new program—due to the need to build special and general purpose libraries—it is easier to maintain. Both program flow and data typing are more visible in Pascal and, without a doubt, much more flexible.

Pascal was a satisfactory choice for the General, and particularly so, the variant called Pascal/MT.☐

Program on page 166

THE COMPUTER AS A LEARNING AID



by Dennis W. Chamberland

For years people have sought to make learning easier. This program utilizes some characteristics of both the computer's 'brain' and our own to help us learn more efficiently.

Psychologists have discovered some things about learning that this program utilizes very efficiently. These aids to learning are: repetition, differentiation of presentation, feedback and subliminal perception.

The program utilizes Applesoft Basic, but there is nothing too unique to prevent its conversion to TRS-80, Pet or other Basic systems. The CALLS, VTABS, etc., are merely delay and position commands whose purposes are explained as program functions. The system was written utilizing DATA statements to enable non-disk systems to run it; also, the DATA statements are just as efficient as disk files in this simple program.

The first use of repetition comes when the material is entered in a question and answer form in the DATA statements. The question is separated from the answer by a comma. After all questions and answers are entered, the student can chalk one accomplishment up to his credit, as just the mechanics of entering the data was a good review of material in itself. Phase II of the learning process comes when the program is run.

The program was designed for maximum learning flexibility. As a part-time student of graduate engineering subjects, my DATA statements often run on for pages. So I found it helpful to be able to review different portions of my notes without having to step through every question and answer prior to that point. In the DATA statements, the chapters or sections are divided

by '*'. The program keeps track of chapters in this way. The program starts by asking which chapters will be reviewed. One can review the entire set of statements by entering 1 for start chapter and 100 for last chapter.

The next question the program poses is designed to select review speed. After the notes have been reviewed a few times, the need for repetition has diminished. Hence, by designating either normal or rapid review, the computer will pace its display of data and the student can most efficiently utilize his time. This function is described later.

The final question also deals with time utilization. It provides for an optional direct interaction with the computer. The program asks simply "Do you want interaction?" If the response is "no," the program proceeds without it. If one answers "yes," the program will allow the student to input the answer after the question and before the display. This feedback is quite useful to the learning process during early reviews, but would be too time consuming during the final review stages; hence the option.

The program is not designed to "compare" the input answer with the answer in computer memory for several reasons. Primarily because the computer evaluates all inputs exactly—i.e. if an extra space, comma, or period were inserted in an answer, or if a word were left out or interchanged, the computer would evaluate the answer as "wrong." It would be quite an unnecessary chore in most cases to remember exact spacing and working of several dozen multi-line answers. This program was designed for facilitating the learning of concepts more than rote memory of individual data elements. The brain is left with evaluating whether the answer offered is close enough to the answer displayed by the computer. No one keeps score. (The instructor takes care of that later.)

And now that the computer knows what the student wants, lets run through an example. Our DATA statement to be reviewed will be:

DATA WHAT COLOR IS AN ORANGE?, BABY ORANGES ARE GREEN BUT TURN ORANGE AS THEY RIPEN.

The computer will clear the screen and display the questions as:

**WHAT COLOR IS AN ORANGE?

If the operator has asked for interaction and normal review, the computer will await an input. This was his answer:

?NEW ORANGES ARE GREEN, BUT THEY TURN ORANGE. (input)

The computer will pause very briefly to allow the student to look at his input, then will display the answer:

BABY ORANGES ARE GREEN BUT TURN ORANGE AS THEY RIPEN.

The computer now waits for the student to press any key. This allows the student to select how much time he wants to spend learning the answer. Once the student presses any key, the computer clears the screen below the questions and displays the answer black on white (reversed), and at a reduced print rate. This allows for a different "look" at the answer, further imprinting and reinforcing the memory. The student again selects the length of time he spends with the answer and presses any key to go on.

At this point, the computer provides another stimulus called subliminal perception. The computer flashes the answer very quickly three times in rapid succession. There is wide speculation that this subliminal imprinting has a very powerful effect on subconscious perception and learning.

As the student becomes more familiar with the material, he may prefer to review it quickly. This can be done by requesting 'no interaction' and asking for a 'rapid review.' In this case, the question is displayed; its answer follows the press of any key. After another press of any key, the program goes on to the next question, bypassing repetitive displays and the subliminal perception routine.

As in any learning process, the student should observe these procedures for the most efficient results:

1) The student should be interested in the subject matter.
2) The study area should be free of distractions.
3) The student should be comfortable.
4) A single study session should last no longer than 30-45 minutes followed by a break of equal length.

Nothing comes for free. And learning is no exception. But the use of the computer to aid in the learning process is an important step in a very complex future where the 3-R's are only a tiny first step. □

Program on page 172

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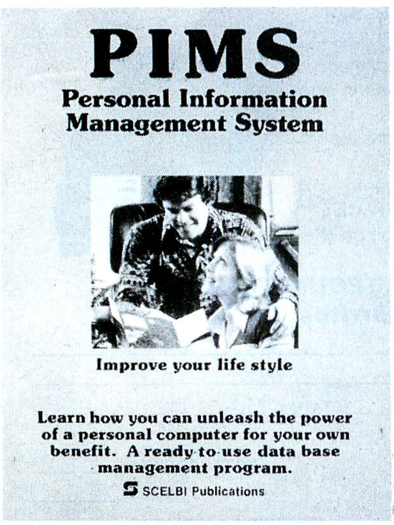

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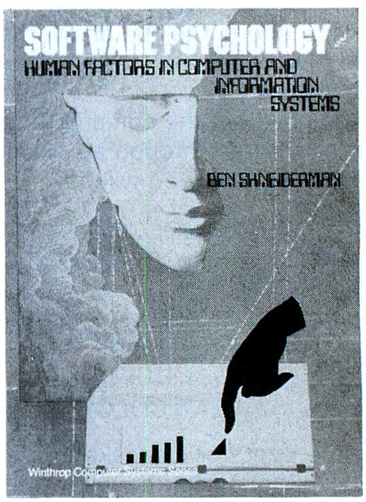

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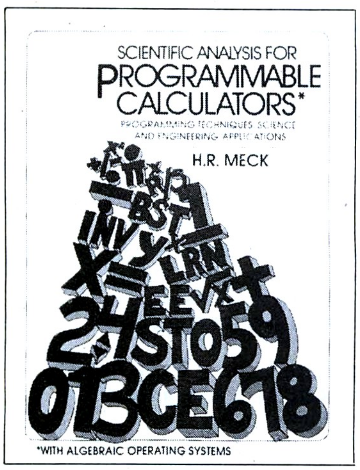

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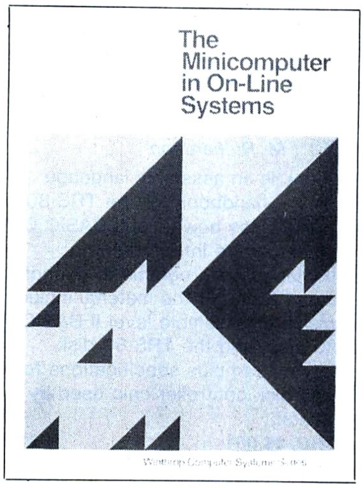

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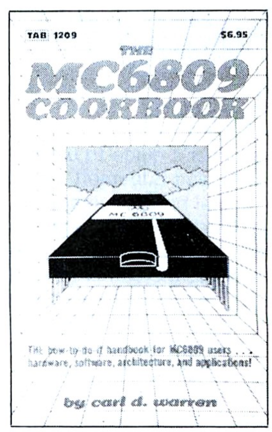

The MC6809 Cookbook
By Carl Warren

This book explains the general architecture of the MC6809 chip, including details on accumulators, registers, condition codes, stack pointers, program counters, addressing modes and more. Then it's

right into the MC6809 instruction set: load instructions; transfer instructions: accumulator instructions such as shift, branch, and register. Each instruction is well-presented and clearly defined, including hexadecimal and binary equivalents. This book is an ideal companion for those wishing to use this new, versatile, and exceptionally desirable micro chip in any system design.
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By Raymond Guido

Here's a variety of programs in BASIC to help the businessman, scientist and engineer. The book shows how to apply the languge to practical problems and equations. Formulas cover calculations of interest, payback periods, mortgage schedules, techniques for extending number of useful digits in monetary calculations using limited BASICs. A variety of electronic applied formulas are programmed. The mechanics chapter covers resultant - force calculations, attractive forces due to gravity, projectile motion prediction and graphing, moments of inertia for T-section, I-section and channel sections. The mathematics chapter includes programs to solve the quadratic formula, general summation formulas, such as sum of geometric progression, number conversion program algorithms to compute sine, cosine, tangent and log e.
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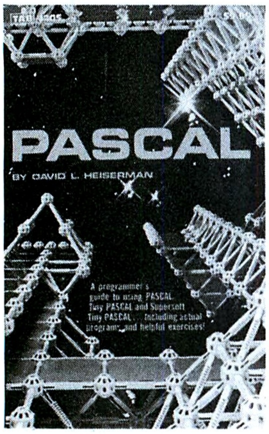

PASCAL
By David L. Heiserman

A programmer's guide to using PASCAL, Tiny PASCAL and Supersoft Tiny PASCAL, including actual programs and helpful exercises. Starting with an explanation of how to load a Tiny PASCAL cassette into a TRS-80 system, the author goes through all the steps necessary to become proficient in this new language. You'll learn how to read syntax diagrams; use WRITE statements to print characters and do TRS-80 graphics, enter integers with READ statements; use logic with AND, OR and NOT. You'll also find out how to put together complete READ and WRITE programs, and use repetitive statements to write unending loops, plus how to "good-proof" entries. And once you've learned the basics, the rest of the book is designed to help you use them in writing and using subroutines, in playing games, in animating.
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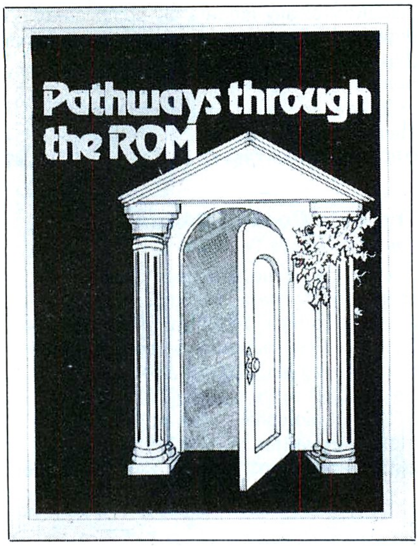

Pathways Through the ROM
By George Blank, Roger Fuller, Hon Hartford, John T. Phillipp and Robert M. Richardson

This book is an assembly language programming handbook for the TRS-80 user. It discusses how level II BASIC ROM subroutines can be integrated into assembly language programs to economize on memory. Some of the material includes: programs to disassemble level II BASIC, the Z-80 chip, and the TRS-80 disk operating system plus specifications for the floppy disk controller chip used by Radio Shack.
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By John A. Kuecken

Here is an easy way to acquire the skills needed to keep up with the sophisticated world of microprocessors. The author clearly explains and examines all the concepts crucial to the use of microprocessors in any application, and fully details every phase of logic and machine decisions: Boolean algebra, the truth table, OR, NOR, AND and NAND functions, etc. Binary, hexadecimal and octal notations are completely covered, as are ripple counters, registers, decoders and flip-flops.
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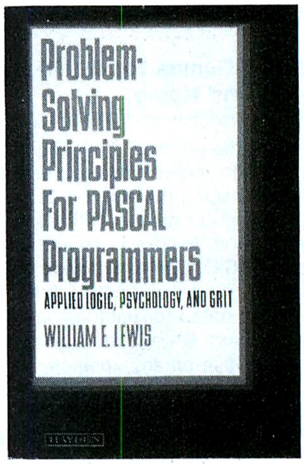

Ciarcia's Circuit Cellar
By Steve Ciarcia

This book is useful by providing information about the microcomputer. Included are amusing anecdotes introducing various articles needed to construct numerous computer projects. They are explained in such detail that beginners can make their microcomputer perform the same useful functions. Such an easy-going style and presentation makes it understandable and enjoyable.
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Problem-Solving Principles for PASCAL Programmers
By William E. Lewis

Here's a valuable text for improving problem-solving techniques in computer programming. It provides not only a problem-solving background, but also alternative solution paths to choose from. After introducing the basic building blocks of problem solving, the book offers independent prescriptions that focus on remedies for typical programming problems. A special chapter on the top-down approach and a section on debugging are included.
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By the staff of the Texas Instrument Learning Center

Here is the first comprehensive, practical book on the use of the modern programmable calculator. Written primarily for users of the TI 58 and 59 calculators, this information is also applicable to other programmable calculators. The book features step-by-step programs and examples that are easily adaptable for on-the-job needs in such fields as mathematics, statistics, business and operations research, economics, biology, engineering, physics and astronomy. This unparalleled sourcebook provides engineers and other professionals with a better understanding of the programmable calculator and its ability to provide faster, more accurate solutions in a variety of daily situations.
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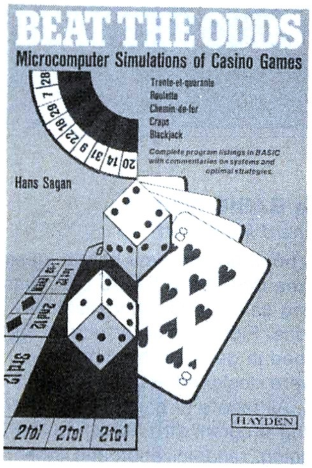

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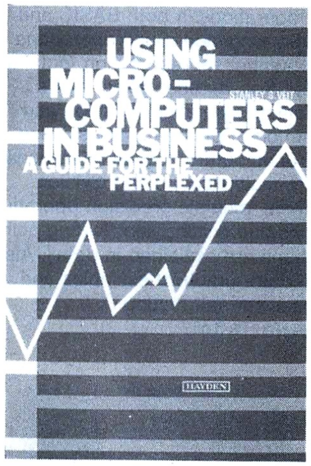

Using Microcomputers in Business
By Stanley S. Veit

This book is an essential background briefing for any purchaser of microcomputer systems or software. It describes the advantages and disadvantages of computerization and gives the potential user the information necessary to make intelligent decisions. It is written in a fast-moving style, without the usual buzz words and technical jargon. Advice, information and warnings given here are of the type that have been valid in the past and will continue to be valid as long as businesses use electronic computer systems.
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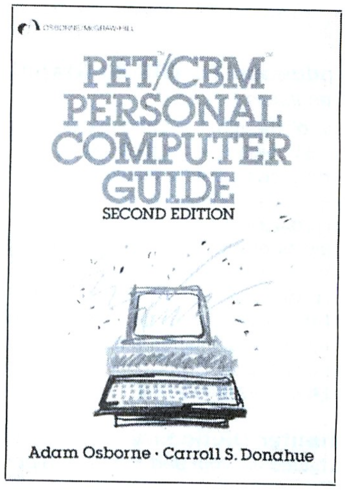

PET/CBM Personal Computer Guide, 2nd Edition
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If you are thinking about buying any personal computer, this book will show you what the PET can do for you. If you've just bought a PET of CBM, this is the book you must have to really understand your computer. By using the examples found in this book, you'll quickly get your PET/CBM up and running. These examples are thoroughly documented so you can learn how and why the programs work. It's the how and why that are important in learning to make the PET work efficiently for you. This book covers everything you'll need to be a master of your PET.
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By Don Lancaster

An in-depth coverage of TV typewriters, the truly low-cost microcomputer and small-systems display interface. Covers TVT terminology, principles of operation,

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By Jonathan A. Titus, Christopher A. Titus and David G. Larsen

This book shows you how to design a microcomputer using the 8085A microprocessor chip. First, the basic concepts, such as internal organization and timing, are thoroughly discussed. Then, details on system control, memory systems and types, interfacing and 8085A family-compatible chips are given. Finally, all the information necessary for you to design several completely operational 8085A-based microcomputers is presented.
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Invitation to PASCAL
By Harry Zatzan Jr.

The primary objective of this book is to teach the reader to write readable and reliable programs in the PASCAL programming language. The book has many side benefits including methods of problem solving, program design and structured programming. In addition to introducing the PASCAL language, the book emphasizes programming style and stresses the important difference between "good" and "bad" programs. This difference is related through textual material and programming examples. Techniques are provided throughout the presentation on points that contribute to good programming.
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Microcomputer Math
By William Barden, Jr.

The purpose of this book is to remove some of the mystery surrounding common binary operations in both BASIC and assembly language. Such operations as binary number representation, octal and hexadecimal representation, two's complement operation, addition and subtraction of binary numbers, "flag" bits in microcomputers, logical operations and shifting, multiplication and division algorithms, multiple-precision operations, fractions and scaling and floating-point operations are explained in detail. Also included are practical examples and exercises for self-testing.
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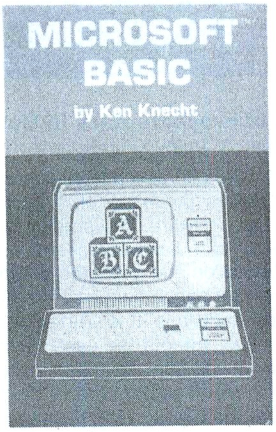

Microsoft BASIC
By Ken Knecht

In personal computing, effective computer use almost always requires a good working knowledge of BASIC. This book presents a complete introduction and tutorial on programming in BASIC. The book illustrates the concepts presented with examples that actually run, using the popular MITS family of BASIC interpreters. It starts with the simplest and most commonly used commands and then progresses on to the more complex BASIC commands.
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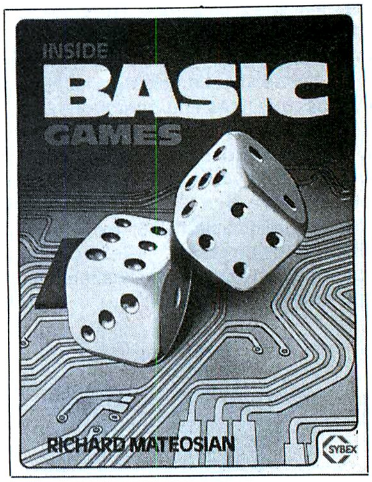

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By Richard Mateosian

This book teacher you how to design error-free interactive BASIC programs including games and other real-time situations. Eight computer games are described in detail, illustrating how they were designed and developed in BASIC. All facets of game program design, including program structuring, cursor positioning, randomization and other concepts are discussed. Programs for games such as Hangman, Ten-Key Flicker, and Taxman are coded in Microsoft BASIC. Versions are also provided for PET/CBM, Apple II and TRS-80.
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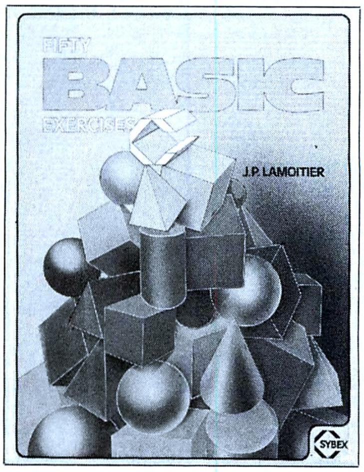

Fifty BASIC Exercises
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This book is designed to teach BASIC through actual practice. It presents graduated exercises in mathematics, business, operations research, games and statistics. Each exercise contains a statement and analysis of the problem, a solution with a flowchart and comments, and a program implementing the solution accompanied by sample runs. Besides allowing you to check your understanding and progress while learning, this method teaches problem solving in a top-down manner. The book stresses programming style and the reasons behind each design decision.
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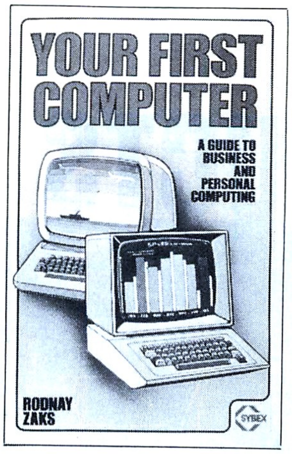

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Here is a book for the microcomputer user who want to implement FORTRAN on his machine. Even if you have never used FORTRAN before, you will be writing and running FORTRAN programs almost at once. Features of Microsoft FORTRAN, such as the compiler, editor, and linker are thoroughly explained. The uses of disk, printer and video terminal are considered in great detail.
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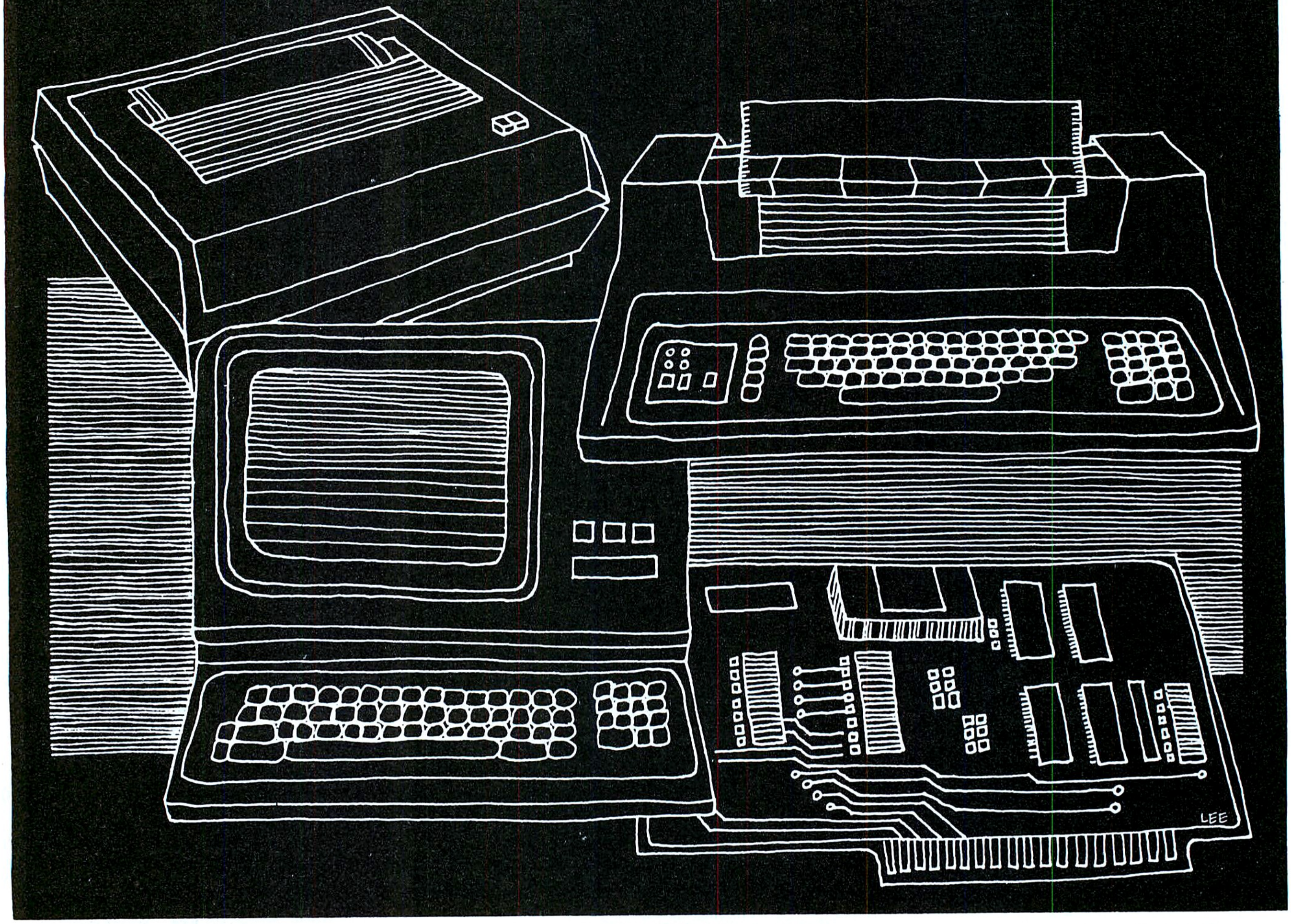

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CRC generator/checker is designed for high reliability data communication systems. The COM 8004 performs 32-bit CRC generation and detection. CRC, or Cyclical Redundance Check, is the most popular and effective method for detecting errors in synchronous data communications links. CRCs are generated by dividing the serial message stream by a specified polynomial at both the transmitter and receiver. The COM 8004 is designed to perform this function for SDLC and HDCL-type data protocols. The device has two independent halves, each of which may be operated to generate or check the CRC. It is inserted directly in the serial data path between the USRT and the modem. Price: 100 pieces, $15. Standard Microsystems, 35 Marcus Blvd., Hauppauge, NY 11787, (516) 273-3100.
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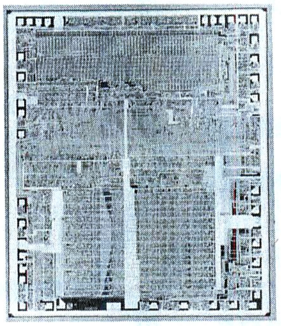
16-bit microprocessor, the F9445, will be offered in three speed ranges: 16 MHz, 20 MHz, and 24 MHz. Register-to-register time for the 24-MHz device is 250 nS. The device is a high-performance microprocessor with extremely fast multiply and divide



capabilities. For example, the 20-MHz device can perform a 16 by 16-bit multiplication in 3.5 Ms. Fairchild Camera and Instrument Corp., Microprocessor Div., 4800 Patrick Henry Dr., Santa Clara, CA 95051, (415) 962-3816.
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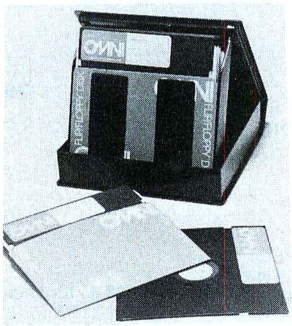

notches, two index holes and reinforced hub rings. The disk can be used on most 5¼-in. disk drives. Price: $21 for five-pack. Omni Resources, 4 Oak Pond Ave., Millbury, MA 01527, (617) 799-0197.
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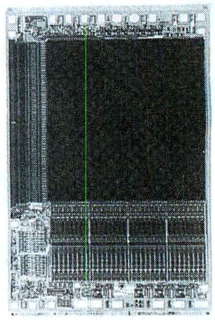
4096 by 4-bit bipolar PROM is produced in a 300-mil center, 20-pin DIP, with JEDEC approved pinout. The Am27S40 with open-collector outputs and the Am27S41 with three-state outputs offer a 50nS maximum access time in their standard versions and 35nS maximum access time in ultrafast



"A" versions. A three-state power-switched Am27SP41 relieves system power problems by reducing power consumption from 875mW to 425mW when deselected. Power up to full accessibility takes a short 10nS. Advanced Micro Devices Inc., 901 Thompson Pl., Sunnyvale, CA 94086, (408) 732-2400.
CIRCLE INQUIRY NO. 228

32K-bit ROM device, the TMS6125, stores speech data for TI's voice-synthesis processors and has such advanced on-chip features as auto-incrementing, address decoding, and look-up and branching capabilities, as well as a gate-programmable oscillator. In addition to storing speech data, it can be used in a wide range of other ROM applications. Capable of storing a 30-50 word vocabulary, the device meets the needs of speech customers who require ROMs with a smaller storage capacity. Internally organized as 4K by 8, it can be mask-programmed to provide either one-bit serial output or a four-bit parallel output. The device also has an internal chip-select option that can be mask-programmed to allow the parallel connection of up to four TMS6125 devices for a total access of 16K bytes of memory. This equals about 200 words or 100 seconds of speech. Price: $3.63 in production quantities. Texas Instruments Inc., Central Literature Response Center, P.O. Box 202129, Dallas, TX 75220.
CIRCLE INQUIRY NO. 229

Dot-matrix impact printer features 3 lines-per-second bi-directional printing, and 10 lines-per-second line feed. The model M-410 accepts single or multi-ply paper rolls from ¾-in. to 3⅞-in. wide, and prints a 3⅓-in. line. Capacity is 40 columns (at 12 characters per inch). The model features a long-life printhead with a rated life of 100 million characters. The new head is designed for continuous printing without overheating. The overall mechanism life is 50 million cycles. Interface with the new unit is simplified because line feed is independent of the main drive mechanism, thereby eliminating the need for timing line feed commands to correspond with particular printhead positions. Clock signals are also unnecessary for energizing the printhead solenoids, because the print

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- High Resolution Graphics (Std.)
- Parallel and serial I/O
- Asynchronous and synchronous protocols
- Computer Network capability
- Hardware expandable with plug-in-boards
- Built-in Floppy Disks with up to 616 kB per drive
- Hard disk optional
- KOS, KONTRON's multi-tasking CP/M-compatible operating system
- Assembler, Basic, Cobol, Fortran, Pascal
- Utility software packages

PSI ψ 80 = **P**rofessional **S**ystem **I**ntegration

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CIRCLE INQUIRY NO. 44

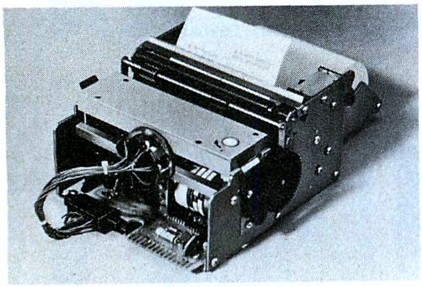
This is only a small part of the PSI-force. Contact us to learn more.

In Europe: KONTRON MIKROCOMPUTER GMBH
D-8057 ECHING/MUNICH
TEL.: 89-31901-1 · TELEX: 522122

In USA: KONTRON ELECTRONIC INC.
630 PRICE AVE., REDWOOD CITY, CA. 94063
TEL.: 415 3611012 · TELEX: 910 378 5207

d&m 1375

speed of the printhead is carefully controlled. Clock signals are provided, however, for



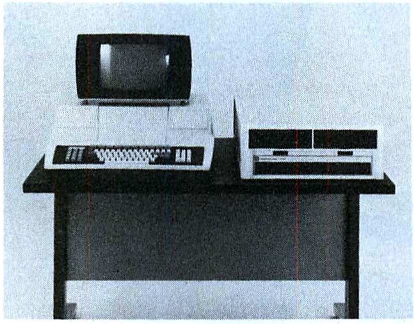
engineers who wish to use them. Eaton Corp., Count Control/Systems Div., 901 S. 12th St., Watertown, WI 53094, (414) 261-4070.

CIRCLE INQUIRY NO. 231

Bipolar RAMs, the SN74LS219A and SN74LS319A, with non-inverting data output, simplify system interfacing for the designer. Fabricated using low-power Schottky bipolar technology, the RAMs offer typical access times of 50 nS (access time from address). Requiring a single 5-volt power supply, the devices have a typical power dissipation of 193 milliwatts. Both 64-bit RAMs are TTL compatible and are organized in a 16-word by 4-bit format. The SN74LS219A, which has a three-state output, combines the convenience of an open-collector output with the speed of a totem-pole output. The SN74LS319A also provides an open-collector output and has the capability for direct interface with data lines that have a passive pull-up. Both RAMs are thus well suited for cache memories, buffers, or other applications requiring high-speed, low-power data storage. Price: $3.60 each in 100-piece quantities. Texas Instruments Inc., Central Literature Response Center, P.O. Box 202129, Dallas, TX 75220.

CIRCLE INQUIRY NO. 233

Floppy-disk system, the TMAM9000, is a low-end addition to TI's line of Multi-AMPL development systems. The TMAM9000 will support both current and future developments in TI technology, including TI's entire line of programmable function devices: TMS9900/990 16-bit microprocessors and microcomputer modules, TMS1000 4-bit microcomputers, and TMS7000 8-bit microcomputers. The system is a cost-effective tabletop system that includes a TMS9900-based central processing unit (CPU) with keyboard and display, and a separate floppy-disk enclosure providing 2.2M bytes of mass storage on two double-sided, double-density floppy disk drives. The CPU has 64K bytes of random access memory (RAM) and features 4 MHz operation. The floppy-disk unit offers four times the storage capacity and ten times the data-transfer rate of previous FS990 AMPL systems. Price: $13,350, including complete documentation, field installation, TI's analyst and telephone

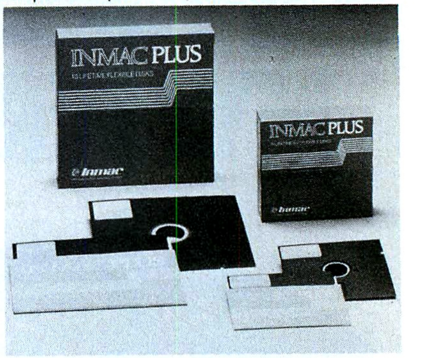


hotline information services, and a one-week training course at the nearest TI Regional Technology Center. Texas Instruments Inc., Central Literature Response Center, P.O. Box 202129, Dallas, TX 75220.

CIRCLE INQUIRY NO. 238

CPU/MEMORY

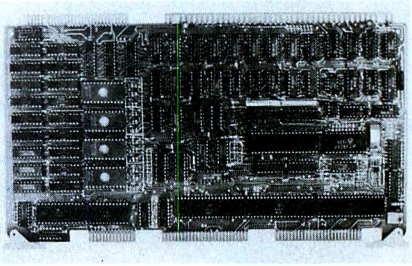
Flexible disks are compatible with most popular 5¼-in. and 8-in. drives. The product line, Inmac Plus, eliminates misalignment with a reinforcing ring. The disks are certified 100% error-free at 50% clipping level. A flexible coating that resists oxide flaking caused by the stress of drive heads and pressure pads is another feature. Magnetic computer tapes are included with the disks.



Inmac, Dept. 8D, 2465 Augustine Dr., Santa Clara, CA 95051, (408) 727-1970.

CIRCLE INQUIRY NO. 239

Stand alone microcomputer board, OB6000, is functionally interfaced to the Intel Multibus backplane by way of the card



edge connector. The heart of the board is the Motorola MC6808 CPU. To enhance real time operations, the two levels of interrupt have been expanded to ten. Nine of these interrupts may be masked. All the interrupt sources may be routed to the ten inputs in any combination by use of jumper options. The board contains sufficient memory for most applications with 9K bytes of static RAM. The I/O capability of the OB6000 with three MC6821 peripheral interface adapters has a total of 60 bits of binary I/O. Omnibyte Corp., 245 W. Roosevelt Rd., W. Chicago, IL 60185, (312) 231-6880.

CIRCLE INQUIRY NO. 240

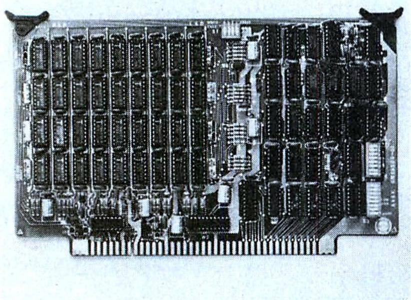
Micro floppydisk drive system for memory storage in text editors and personal/business computers offers the unprecedented combination of large capacity and very small size. With a memory capacity of

437.5K bytes on one side of the disk, the 3.5-in. Micro Floppydisk storage capacity is two times, and recording density 1.47 times that of the 5.25-in. format. Sony Corp. of America, 9 W. 57th St., New York, NY 10019, (212) 371-5800.
CIRCLE INQUIRY NO. 244

64K memory board is fully compatible with any S-100 bus-based Cromemco Cromix system. SUPERAM 4C boards are organized in two blocks of 32K bytes. Each 32K block can be placed in any of eight different memory banks. Bank selection is available on 32K-byte boundaries. Address and bank assignment of each 32K block is selectable

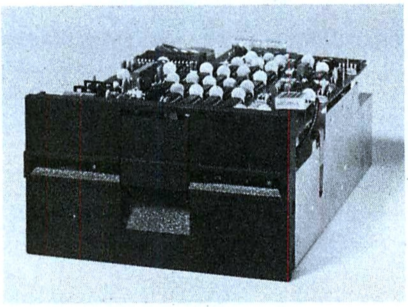
via simple switch settings. Memory refresh is totally transparent to the processor. Memory access time is 250 nS. Operating speed is 4MHz with no wait states. The power requirements are +8 volts at 0.8A; and +18 volts at 0.2A. Price: $995. Piiceon Inc., 2350 Bering Dr., San Jose, CA 95131, (408) 946-8030.
CIRCLE INQUIRY NO. 246

Dynamic memory module, GMS6505, is addressable in segments, offers parity



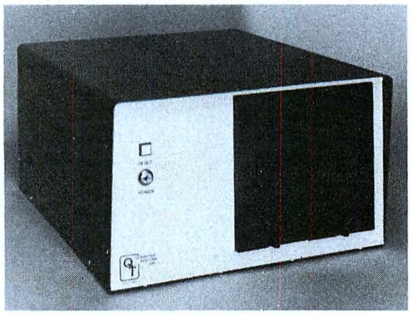
generation and check, and has on-board refresh. It also features write protect, over voltage and reverse polarity protection, and allows users to address multiple 65K memory banks. Selectable speeds, extremely low power consumption and direct compatibility with 6500/6800 families are additional features. The 6-in. by 9.75-in. GMS6505 module, which uses only 5 watts of power, can directly interface with the Motorola EXORciser II, Rockwell AIM 65 and System 65 motherboards. All GMS products are burned-in for 72 hours and carry a one-year warranty. Price: $526. General Micro Systems, 1320 Chaffey Ct., Ontario, CA 91762, (714) 621-7532.
CIRCLE INQUIRY NO. 248

5¼-in. floppy disk drive offers up to 2M bytes of storage in a single drive. The Megafloppy 1117 family includes two single and two double sided drives using 96 or 100 TPI (tracks per inch) double track recording technologies. The model 1117 provides 6 mS track-to-track positioning speed with 600,000 bit per second data transfer rates, and also provides a full compatibility with industry



standard interfaces, mounting dimensions and bezels. Double sided models of the megafloppy 1117 family provide 2.175 and 2.025M bytes of formatted storage at 100 and 96 TPI respectively; single sided versions offer 1.2 and 1.1125M bytes at 100 and 96 TPI respectively. Micropolis Corp., 21329 Nordhoff St., Chatsworth, CA 91311, (213) 709-3300.
CIRCLE INQUIRY NO. 252

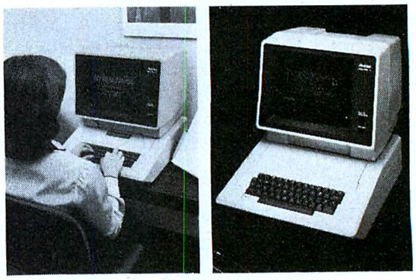
Mainframe with built-in versatility and fast delivery is one of the most versatile dual 8-in. mainframes on the market. It will accommodate 6, 8 or 12 slot card cages using the Silence + motherboards. By adding a CPU, memory board, disk controller and terminal, the user has an inexpensive quality computer system. The MF+DD accepts



Shugart, Remex, Siemens and other standard 8-in. disk drives. Other features include IEEE S-100 compatibility, steel cabinet, 25-amp power supply, keyed power switch, reset switch on front panel, line filter for electrical noise suppression and a circuit breaker for safe operation. QT Computer Systems, Inc., 15620 S. Inglewood Ave., Lawndale, CA 90260, (213) 970-0952.
CIRCLE INQUIRY NO. 254

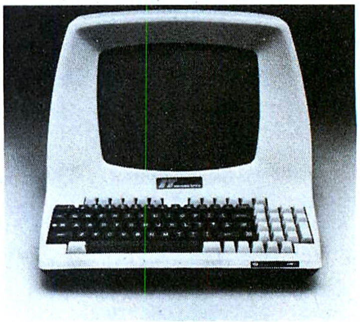
DATA COMMUNICATIONS

Green phosphor monitor, Video-300, with P-31 non-glare display cuts the reflection for easy viewing. The monitor has a 12-in. screen size, 18 MHz band width and resolution of 1000 TV lines (center), 800 (corner). It is ideal for word processing and other applica-



tions. The compact plastic cabinet, weighing 17 lbs., provides easy portability. Its dimensions are 14.5 in. wide by 11.4 in. high by 13.4 in. deep. Price: $249. Amdek Corp., 2420 E. Oakton St., Suite E, Arlington Heights, IL 60005, (312) 364-1180.
CIRCLE INQUIRY NO. 255

Video display, ADM 31 intermediate terminal, is offering enhanced capabilities. These include programmable function keys, a 25th line for terminal status, smooth scroll, X-ON and X-OFF, cursor on/off, and a horizontal split screen. Other standard features include two full 1920-character



pages of memory, block mode operation, complete editing capability, function keys, visual attributes (blinking, blanking, underlining, reduced intensity and reverse fields) and business graphics. In addition, the unit offers a number of features that can be modified dynamically at the keyboard, as well as self-test, typewriter tab stops, formatting and protected fields. The 12-in. diagonal CRT screen displays 25 lines of 80 characters in upper and lower case. Lear Siegler, Data Products Div., 714 N. Brookhurst, Anaheim, CA 92803, (714) 774-1010.
CIRCLE INQUIRY NO. 258

Multi-purpose modem, VersaModem model 1080, provides users needing only a minimum feature modem with a high-quality, reliable, direct-connect alternative to older acoustic couplers. Applications include remote databank access, timesharing, stock broker systems, videotex and electronic mail. In addition to providing a link to information

utilities such as The Source, Compuserve, Dow-Jones, computer bulletin boards and university computers, the modem offers access to a variety of specialized online databanks and timesharing services. It can be used with standard data terminals and a host of personal computers at comm rates of 300 baud and below using Bell standard 103 protocol. It is FCC registered and supplied with a modular plug for direct connection to the telephone network, eliminating the need for a phone company coupling device. Price: $119. Bizcomp Corp., Box 7498, Menlo Park, CA 94025, (415) 966-1545.
CIRCLE INQUIRY NO. 261

Full-duplex modem enables terminals and processors to communicate over unconditioned dial-up lines. The DF03 operates asynchronously at data rates of 0-300 or 1200 bits/second and synchronously at 1200 bits/second. The unit is available in two versions: the DF03-AA and the DF03-AC. Each features manual originate, manual answer and automatic answer mode. The DF03-AC also provides automatic originate (autocall) mode, and is one of the first modems in the industry to provide serial autocall at a 1200 bits/second rate. Both verisons are compatible with all of Digital's synchronous and asynchronous data communications controllers that support the EIA RS232-C interface standard and offer Public Switched Telephone Network (PSTN) modem control. The DF03 is also compatible with the Bell System 212A modem. Prices: DF03-AA, $950; DF03-AC, $1,350. Digital Equipment Corp., 146 Main St., Maynard, MA 01754.
CIRCLE INQUIRY NO. 263

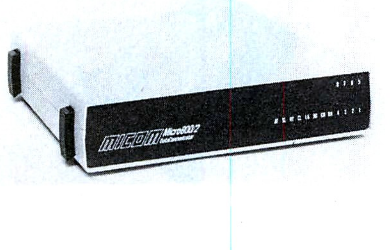
Direct-connect modem for both TRS-80 models I and III microcomputers replaces a previous model designed for use with the model I only. The Lynx modem is also

manufactured for Apple II and II Plus machines. Standard features include auto-dial and auto-answer functions, originate/answer, programmable word length, parity, number of stop bits and full/half duplex. Also provided are active clear break keys, control, programmable I/O porting and either keyboard-

dialing or stored-number selection operation. The unit utilizes no ROM routines, so Radio Shack changes in TRS-80 programming, when they occur, will have no effect on the modem's operation. It connects to either the keyboard or the expansion interface on model I, and to the 50-pin I/O bus jack on model III. In addition, it can be easily re-ported to permit simultaneous operation of a serial printer, and can be placed on either side of the model III unit. ESI Lynx, 123 Locust St., Lancaster, PA 17602, (717) 291-1116.
CIRCLE INQUIRY NO. 264

Full-duplex modem, model 802, permits Teletype and DEC teleprinters to be transformed into ASR terminals. The 300-baud device allows a single terminal to communicate with DDD, TWX or Telex networks at any given time, based on the operator's keyboard selection. The TSU includes a Z80 microprocessor, 16K RAM and ROM edit firmware and text edit, an easy-to-use editing package. The products are compatible with, and fit inside, Teletype model 43s and DEC LA34, LA36 and LA120 models. Price: $1,350. Tri-Data, 3333 Bowers Ave., Suite 290, Santa Clara, CA 95051.
CIRCLE INQUIRY NO. 265

Statistical multiplexer, Micro800/2 data concentrator, is a second generation unit. Designed to permit up to 16 data terminals, synchronous and asynchronous, to share a single telephone line, it can easily be installed by a non-technical user without changing existing hardware or software. By exploiting new advances in microprocessor technology, the Micro800/2 can offer eight times the performance of the original Micro800 at a lower price. In addition, the new product



includes as standard items many features that were extra-cost options for the earlier model. The unit is more effective than a conventional time division multiplexer since it usually can provide at least twice as much channel capacity on the same phone line. Its data compression feature makes it more efficient than most other statistical multiplexers as well, and it automatic retransmission ensures error-free data communications. Micom Systems, 9551 Irondale Ave., Chatsworth, CA 91311, (213) 882-6890, ext. 227.
CIRCLE INQUIRY NO. 266

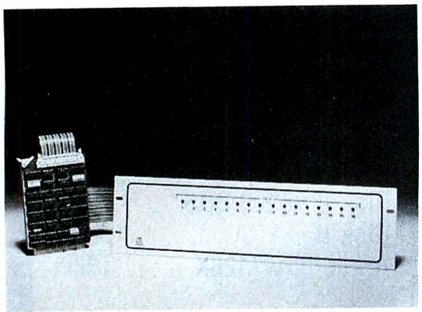
Synchronous/asynchronous buffer, SAB-1, makes it possible to transmit asynchronous data through synchronous modems or synchronous digital facilities operating in either point-to-point or multipoint network applications at data rates up to 9600 bps. The unit accommodates 10 bit ASCII data at seven user selectable data rates. It tolerates input speed distortion of up to $\pm 2\%$ and input bias distortion of up to 43% with less than 3% asynchronous output distortion. Operation is full duplex, half duplex or simplex over dial

access or over private lines in dedicated point-to-point or multipoint applications. The unit automatically and dynamically manages the flow of data and with less than 2½ characters end-to-end delay with no possibility of buffer overflow, it offers the fastest response time in polled multipoint networks. The unit is compatible with an synchronous EIA RS-232C or CCITT V.24/V.28 modem or digital service anywhere in the world. Price: $295 in quantities less than ten. General DataComm Industries, One Kennedy Ave., Danbury, CT 06810, (203) 797-0711.
CIRCLE INQUIRY NO. 267

I/O

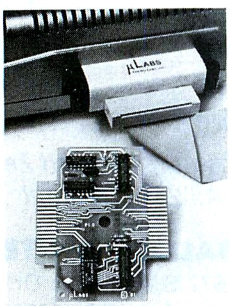
Buffered micropad lets anyone enter data into a computer by simply handprinting on a pressure-sensitive device that emulates a standard ASCII CRT terminal. The device allows users to enter a line or page of up to 512 characters at once, edit and verify it on a built-in LED display, and transmit it to a local or time-sharing computer—eliminating the need for typing skills. The user can fill out specially-designed forms and corrections are made by simply writing over previously entered characters. The buffered version is an enhancement to the standard Micropad, eliminating the need to transmit row-column position data with each character and allowing for local editing, using the built-in, single-line LED display. This reduces computer processing and storage costs and allows users to sign on to time-sharing services, using a standard 110, 300, 600 or 1200-baud modem. Price: $3,100. Micropad, Inc., 35 E. Wacker Dr., Chicago, IL 60601, (312) 346-4667.
CIRCLE INQUIRY NO. 268

Parallel industrial module, 7911/PIM, provides a convenient method of real-world interfacing STD bus microprocessor systems. It offers plug-compatibility with industry standard I/O racks, such as those manufactured by Opto 22 or Gordos. Any channel may be configured as an input or an output to match the particular type of I/O module installed. Any output may be software enabled to generate an interrupt signal to the CPU if desired. The interrupt will automatically be cleared when the corresponding input is read.



Operationally, the unit appears as four read/write registers within the STD I/O map. The base address may be assigned through a six-position DIP switch to any hex X0, X4, X8 or XC location. The 8-bit data registers corresponding to the I/O module positions each have an associated interrupt control register. In order to provide a complete I/O subsystem, a 16-channel I/O rack assembly version is available that conforms to the EIA 19-in. rack standard. Matrix Corp., 1639 Green St., Raleigh, NC 27603, (919) 833-2837.
CIRCLE INQUIRY NO. 269

Parallel I/O board for the Apple II and Apple II Plus computers, the APIO, allows the user to interface 8-bit parallel devices to those computers. The board provides 16 bidirectional data lines and four handshaking lines, for two 8-bit bidirectional interface ports; the direction of the data lines is under software control. The unit carries a 26-pin connector for each of two convenient interface ports. One connector is for user-definable general-purpose applications; the other is for flat-cable connection to any

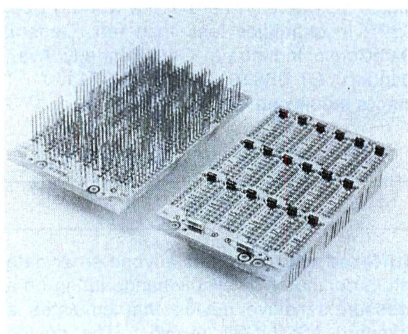


Centronics-compatible printer. The latter connector supplies eight data lines and two handshaking lines in support of the Centronics interface. On-board firmware in PROM is supplied to operate a Centronic-compatible printer, and to provide a slot-independent routine for running the unit in any Apple slot from 1 to 7, using the standard PR# Apple command. To implement a user-developed driver, there is a jumper option that permits use of 2122 RAM in place of the firmware PROMs supplied. Price: $109, assembled and tested, and without a cable. SSM Microcomputer Products, 2190 Paragon Dr., San Jose, CA 95131, (408) 946-7400.
CIRCLE INQUIRY NO. 275

In circuit emulator for 8048 family of one chip microcomputers is S-100 bus compatible. Mice-48 is capable of emulating the Intel (or equivalent) 8035/8039/8048/8049/8748 parts, the National 8040/8050 parts, plus the new 80C48/80C35 CMOS versions from NEC and others. Contained on one standard S-100 board, Mice-48 runs under CP/M operating system on any 8080 or Z80 based CPU. A ribbon cable with a buffer assembly connects the emulator to the user system by replacing the user's 8048 processor. Emulation is done in real time using user's clock or crystal at speeds up to 11 MHz. Other features include: trace, unlimited number of breakpoints, and display/modify of program memory, external RAM, registers, I/O ports and flags. A mapping command allows the user to map program memory to user's PROM /EPROM or to emulator's RAM. It comes with all supporting software including a powerful 8048 macro assembler. Price: $950. Signum Systems, 726 Santa Monica Blvd. #217, Santa Monica, CA 90401, (213) 451-5382.
CIRCLE INQUIRY NO. 276

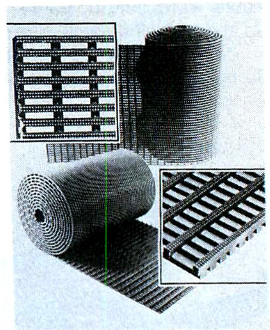
MISCELLANEOUS

2D logic board provides high density layout for up to twelve 18-pin memory chips and up to six 20-pin tri-state octal drivers. The combination meets the designer's need for a committed power board (low impedance power connection) for commonly used memory systems. The static RAM/utility wire-wrap board is ideally suited for use with the following IC types among others: 1024 by 4-bit and 2048 by 4-bit fuse link PROMs; 1024 by 1-bit XICOR X2201 EEPROMs; and CMOS and MOS RAMs in 1, 4, 8, and 12-bit



configurations. In addition, the 2D board accommodates mixes of 14, 16, 18, and 20-pin high-speed Schottky or standard TTL DIPs for general logic applications. Maximum high frequency noise immunity is afforded by a ceramic by-pass capacitor at each DIP location, and low frequency noise is suppressed by two tantalum capacitors for every 18 DIP locations. All capacitors are military grade. Prices: H-2976-01, $84; H-2977-01, $163. EECO Inc., Electronic Packaging Products, 1601 E. Chestnut Ave., Santa Ana, CA 92701, (714) 835-6000.
CIRCLE INQUIRY NO. 277

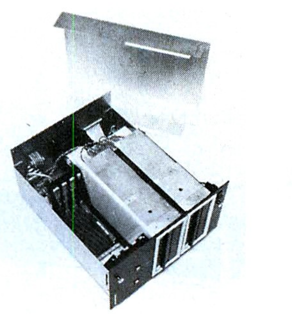
Anti-static mat is also an effective anti-fatigue device. Vynastat is extruded from specially formulated, conductive PVC. It is a grid construction formed by securely heat welding the extruded strips. The embossed tread on top and bottom prevents slipping



and keeps the mat in place even on slippery surfaces. The mat is 3/8-in. thick. The resistivity from the mat to the end of grounding tape is 1.9 by 10^6 ohms. The anti-static feature is permanent; it cannot rub off or wear off as with sprays or surface coatings. The inch wide grounding tape that is extruded from the same material used in the mat, drains static charges much more rapidly than ordinary grounding wires. The mat is intended for use in stand up applications where computer equipment, word processors, bank, airline, and point-of-purchase terminals and other data processing equipment, is subject to damage or disruption due to static charges. Tepromark International, 206 Mosher Ave., Woodmere, NY 11598.
CIRCLE INQUIRY NO. 280

Keyboard option, Wako, is for the Visual 200 CRT terminal. It consists of a series of color coded keys that are dedicated to the various functions of the Wordstar word processing program. These keys increase operator efficiency by eliminating the need for commands that require the combination of several keys. For example, centering a line requires the combination of the control plus O, plus C to initiate the command. This is accomplished by a single stroke of the center line key. Other dedicated functions include: release margin, set right and left margin, clear tab, set tab, underscore, boldface, start block, end block, move block, copy block, delete block, read file, find text, replace text, abort edit, save/done edit, and save reedit. Computer Mart of New Jersey, 501 Route 27, Iselin, NJ 08830, (201) 283-0600.
CIRCLE INQUIRY NO. 282

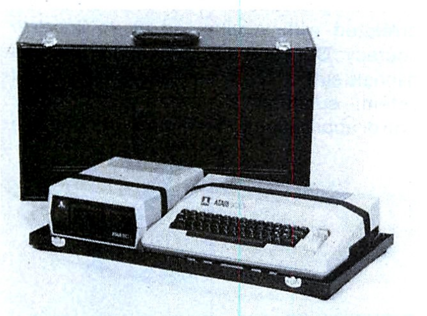
Development chassis is compatible with up to six Multibus printed circuit cards. The model 5200 dual disk drive unit features an



integral six slotted card cage/backplane that swings out to simplify initial priority settings and maintenance. Providing 1 million byte

capacity, the compact chassis incorporates two Innotronics 8-in. double density disk drives with six diagnostic indicators and a write protect switch for each drive. Self-contained in a rugged 10-in. by 17-in. by 21½-in. cabinet or rack mountable aluminum enclosure, the model uses a filtered air recording environment for reliability in industrial applications. The rear panel has a separately filtered duplex outlet, disk expansion connector, and five serial and parallel I/O connector outlets. Price: $3,200. Innotronics Corp., Brooks Rd., Lincoln, MA 01773, (617) 676-7800.
CIRCLE INQUIRY NO. 283

Carrying case is for the Apple, Radio Shack and the Atari line of computers. The AT301 will hold either the 800 or 400 computer with associated peripheral equipments such



as the 410 program recorder, the 810 or 815 disk drive and the 820 printer as well as other pieces of equipment. Price: $109. Computer Case Co., 5650 Indian Mound Ct., Columbus, OH 43213, (614) 868-9464.
CIRCLE INQUIRY NO. 285

Shipping container protects 8-in. and 5¼-in. flexible disks in the mail. Designed to safely accommodate one or two disks, the mailing containers are constructed of rigid cardboard with a dust-free, anti-static plastic

liner. The containers have easy-seal flaps, as well as care and handling instructions printed in several languages. Price: 25 8-in. disk mailers—$30; 25 5¼-in. disk mailers—$15. Dennison Kybe Corp., 82 Calvary St., Waltham, MA 02254, (800) 225-8715.
CIRCLE INQUIRY NO. 287

Firmware upgrade, Screenware Pak II, is added to the on-board operating system, Screenware Pak I, of the MicroAngelo MA512 480v by 512h resolution intelligent graphics board. Pak II offers several advanced features. It significantly improves text processing and terminal emulation. A new high speed Alpha Mode nearly doubles the effective baud rate in terminal emulation mode. A split screen function allows restriction of text operations to a user definable segment of the display. It provides several advanced graphics functions. Pak II permits relative coordinate operations for cursor, vector, point, and region commands. It provides circle generation based on center point and radius. A complete polygon flood algorithm will fill almost any bordered region on the screen. A sophisticated macro facility allows the user to define and store sequences of Screenware commands on MicroAngelo RAM, which can be invoked with a single user call. Scion Corp., 8455-D Tyco Rd., Vienna, VA 22180, (703) 827-0888.
CIRCLE INQUIRY NO. 288

PERIPHERALS

Printing communications terminal, Lex-21, features a built-in modem, a full function keyboard, and a thermal printer that displays upper and lower case characters. It measures

8½ in. by 11 in. by 2¾ in., weighs 5 lbs., and easily fits into half a standard briefcase. A 2K memory for text composition and editing and a 1K line buffer are standard. An industry compatible communications protocol allows transmission rates of either 10 or 30 characters per second. Options include a numeric keypad and a leather carrying case. The unit permits rapid, easy access to powerful data banks and computers from offices, homes, and even hotel rooms. It is designed to give business and professional people ready access to computerized information. Major applications include insurance sales, real estate sales, credit verification, general equipment sales, and electronic mail. Price: $1,195. Lexicon Corp., 8355 Executive Center Dr., Miami, FL 33166, (305) 592-4404.
CIRCLE INQUIRY NO. 290

Smart video terminal, ABM 85, is the first model of its family to be followed by 86, 87, 88, 89 and 90 which will cover a complete

range of conversational, editing, processing, clustered and graphics terminals; monochrome and colored; 12-in. and 15-in. screen

size; and 80 column and 132 column display format. Standard features of ABM 85 include high resolution nonglare green screen, detached keyboard, separate numeric and programmable function keypads, full video attributes, advanced editing, text mode, monitor mode, 25th status line, line graphics, fast and slow scroll, local printing, self test and optional additional page memory. Price: $550 in high volume and $850 for single quantity. Amtek Business Machines, Inc., 2255H Martin Ave., Santa Clara, CA 95050, (408) 727-1510.

CIRCLE INQUIRY NO. 291

Intelligent panel system, IPS 2000, offers a microprocessor-based alternative to traditional, hard-wired control panels and displays. Unlike conventional panels that require large quantities of connecting wire and weeks of design and installation, the unit uses a standard RS-232C asynchronous communi-

cations line and can be installed in minutes. It increases production efficiency while decreasing material and labor costs. Initially, three module types will be available. A lighted, push-botton module containing 32 industrial quality push-buttons with individually controlled lamps, a 4-line by 16-character plasma display, and a keypad/numeric display module containing a numeric keypad and two 8-digit displays are currently available. Computer Technology Corp., Park 50 Technecenter, 2002 Ford Circle, Milford, OH 45150, (513) 831-2340.

CIRCLE INQUIRY NO. 292

Optical card reader can read punched holes, preprinted data or pencil marks on standard OMR cards. OMR 500 utilizes fibre optics to read each card, making it even easier to enter data into a microcomputer. The unit adds an affordable new dimension to card reader flexibility, providing virtually unlimited uses. Applications include small business, the entire educational field, personal computers—wherever data entry is required. It is a simple, fast and low-cost alternate to keyboard data entry, with

processing speeds of less than ½ second for hand-fed cards. Automatic turn-on is a standard feature. The unit is a compact 4½-in. cube and weighs 4 lbs. A single long-lasting bulb provides an accurate and reliable light source. The reader is available with intelligent interfaces to Apple, TRS-80, Pet and Atari that simplify user software requirements. Also available are RS-232 and S-100 interfaces. Price: $1,095, including the intelligent interface. Chatsworth Data Corp., 20710 Lassen St., Chatsworth, CA 91311, (213) 341-9200.

CIRCLE INQUIRY NO. 293

Removable cartridge drive, Mikro-Disc V, is available in five models, ranging from the ultra-low-cost model 2/0—the lowest-priced, highest-performance Winchester drive with 2M bytes of fixed storage—to the model 4/4, with 4M bytes fixed and 4M bytes removable storage. The removable cartridge is available in 2M-byte and 4M-byte versions

in a hermetically sealed package that comes complete with multiple-head assembly, media and actuator positioner. The removable cartridge, measuring 1 in. by 5.75 in. by 7.8 in., weighs under 1.5 lbs. The fixed disk drives, also available in 2M-byte and 4M-byte versions, measure 2 in. by 5.75 in. by 7.8 in. and weigh under 2 lbs. Together, the fixed/removable package precisely matches industry-standard dimensions for minifloppies and fits in the enclosure of 5¼-in. Winchester drives. Both fixed and removable drives still give 100% copy up/copy down capability, and both feature enhanced reliability and portability through a head-lifting feature, which automatically removes the heads from the disk surface during power down. New World Computer Co., 3176 Pullman St. #120, Costa Mesa, CA 92626, (714) 556-9320.

CIRCLE INQUIRY NO. 294

Analyzer and voice controller extracts the most important speech cues in the manner of a real human listener. Tolerant of noise and distortion, it accurately identifies voicing existance, voice fundamental pitch and voicing duration. Vowel cues are cross correlated with voicing, so as to improve accuracy. Conventional radio and telephone channels suffice for this speaker independent system, suggesting a variety of remote control applications. Common kinds of noise

and clicks are suppressed, even when considerably more intense than the message signal. Sixteen separate and distinct commands are recognized with unlimited expansion capability when used with a microcomputer. Suitable for battery power, anyone with a working larynx can use the system, including the handicapped. Anything that can be switched can be controlled by voice, such as pumps, motors, conveyors, lights, etc. Covox Co., P.O. Box 2342, Santa Maria, CA 93455, (805) 937-9545.

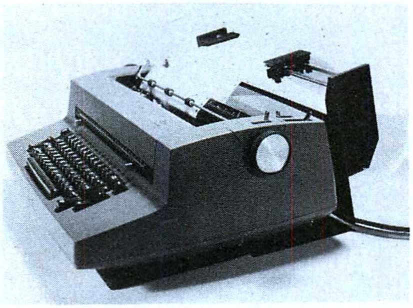
CIRCLE INQUIRY NO. 295

Electric controller, Plug 'n Power, connects to the cassette output on any TRS-80 model I, model II or color computer. It translates instructions from the host computer into controlling signals, which are coupled through normal AC power wiring to remote appliance

and lamp dimmer modules (sold separately). Any one of up to 256 remote modules can be reached with a command to turn on, turn off, brighten or dim a light, or to turn an appliance on or off. Alternatively, a group of up to 16 remote modules can be turned on

or off together, and up to sixteen such groups are accessible. Price: $40. Radio Shack, 1800 One Tandy Center, Fort Worth, TX 76102.
CIRCLE INQUIRY NO. 296

Tractor feed accessory, model 16, allows use of continuous forms with IBM Selectric and other office typewriters or printer units. The feeder is ideal for use on typewriters that have been converted for use as a computer hard copy output device. The unit maintains continuous form alignment, preventing annoying paper skew, which usually makes continuous forms inconvenient or even impossible to use on office typewriters and typewriter-like printers. The feeder installs easily by slipping under the typewriter base, and no electrical or mechanical connections are required. The adjustable-width tractors accept form widths up to 16.5 inches between guide holes, and can be used with



single or multiple part forms. Unlike most tractor-fed printers, which require that one or more forms be wasted when threading the tractors, the feeder allows use of the very first form from the fanfold supply. The feeder unit is lightweight and portable, and needs no maintenance. Price: $150. McAnn, Box 3173, San Mateo, CA 94403, (415) 349-1229.
CIRCLE INQUIRY NO. 300

Speech synthesis device, Vocalizer I, converts serial ASCII data from a computer system into speech. Data is input through the RS-232 interface. The unit can be used as a stand-alone peripheral for paging, instructions, vocal reminders or any automatic speech output. It can also be added to an existing terminal to vocalize portions of the terminal display such as error conditions, operator messages or prompts. The vocabulary can be as large as 800 words. To produce speech, the programmer simply outputs serial ASCII data to the unit through an existing RS-232 port to which the device is attached. The unit vocalizes any words or characters contained in its vocabulary and ignores all others. The Vocalizer contains an internal amplifier, loudspeaker and an RS-232C communications interface that operates from 110 to 19,200 baud. Price: $1,395. Micro Communications, 1509 Government St., Ste. 214, Mobile, AL 36604, (205) 478-1777.
CIRCLE INQUIRY NO. 301

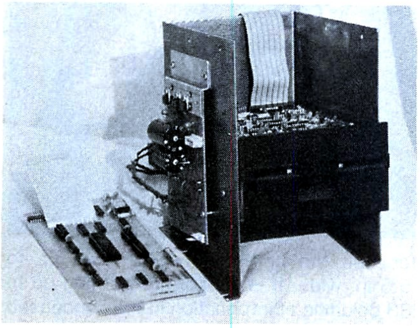
Designer's tool, Softbus, is for the Apple II computer. It plugs into any of the expansion slots and brings the bus structure right to your work area and circuits. It logically routes each bus line assignment to independent control, data, and address ribbons. Each ribbon is three feet long and terminates with a 16-pin dip, thus each bus line assignment is available to be plugged directly into your prototype breadboard. It eliminates wire-wrapping and the bother of pushing and pulling cards in and out of the computer. Price: $50. Passport Designs, Dept. C25-1B, Box 21061, Minneapolis, MN 55421.
CIRCLE INQUIRY NO. 302

High resolution graphics are possible with Texplot for the Texas Instruments Silent 700 data terminals. A screwdriver and 20 minutes are all that is needed to convert any TI model 743, 745, 763, 765 into a multi-function text and graphics terminal. The change requires only the addition of a plug-in board and

pulley. Once installed, the single function 80-column terminal becomes a four-function terminals with 80 print positions per line, 136 print positions per line, and two true high resolution graphics modes. Local or remote selection of any of the functions is easily accomplished by the use of control codes allowing the selection of 80 or 136 print columns in text mode, and 500 or 1,000 dots per line with dot densities of 62.5 or 125 dots per inch in graphics mode. Operating at 1200 baud when hardwired, the unit provides high speed graphics and text output. Price: $450. Texprint, 8 Blanchard Rd., Burlington, MA 01803, (617) 273-3384.
CIRCLE INQUIRY NO. 305

Boot button for the Apple II allows a user who has upgraded to 3.3 DOS (16 sector) to boot a disk in 3.2 DOS (13 sector) with the push of a button. The add-on board is simple to install onto the Disk II controller card. There is no need for motherboard modification. Directions are provided for placing the proper PROM in the proper socket (only 2 chips to worry about). The user simply plugs both his P5 and P5A PROMs into the button and plugs the board into the controller card. Computer Station, 11610 Page Service Dr., St. Louis, MO 63141, (314) 432-7019.
CIRCLE INQUIRY NO. 306

Disk storage subsystem, Disk III, is for the TRS-80 model III computer. The unit is fully calibrated, aligned, tested and burned-in prior to shipping. It may be installed by the company or can be easily installed with only simple hand tools. The basic unit consists of

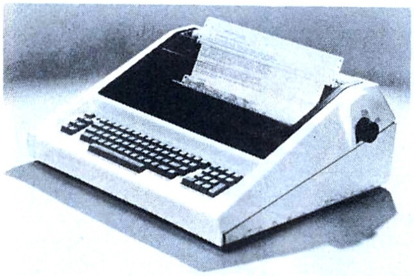


controller, power supply, mounting bracket, one 40-track (6ms) disk drive and associated cabling. Options include a second internal 40-track drive, 80-track disk drives, two-sided 40-track drives, or two-sided 80-track drives. Price: $599. VR Data Corp., 777 Henderson Blvd., Folcroft, PA 19032.
CIRCLE INQUIRY NO. 307

PRINTERS

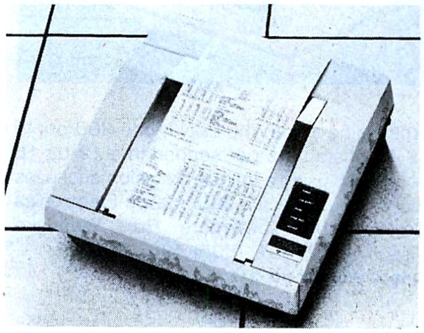
Dot matrix printers are designed for 100% duty cycle to operate continuously at 100 characters per second. Model DIP-81 features friction paper feed, with two different character sizes. Model DIP-82, in addition to friction paper feed, offers six character sizes, complete hardware and software control on line density and vertical form length. DIP-84G includes all features in DIP-82, both friction and tractor feed, and full graphic capability. The DIP-84G offers a 1K buffer and is complete with quick cancel for throughput up to 150 lpm for short lines. DIP-85 incorporates more telecommunication capability of up to 9600 baud, with X-on X-off. Continuous input is a standard feature with models DIP-82, DIP-84G and DIP-85. Price: from $499 to $895. DIP, Inc., 745 Atlantic Ave., Boston, MA 02111, (617) 482-4214.
CIRCLE INQUIRY NO. 308

Teleprinter utilizes dual microprocessor control to print at rates up to 200 characters per second. This permits sustained operation at 1200 baud. Data burst up to 19,200 baud are handled by the buffered RS-232C interface. The 2511 prints bi-directionally with full underlining and true descender capability



using proven 9-pin matrix head. The head is controlled by a digital servo to assure accurate character placement without difficult alignment and tension adjustment procedures. It uses a standard ribbon, available from any office supply store. Price: $1,550. Digi-Data Corp., 8580 Dorsey Run Rd., Jessup, MD 20794, (301) 498-0200.
CIRCLE INQUIRY NO. 309

Electrostatic printer/plotter offers faster printing speed and more character resolution. The V-80 prints a 132-column 11-in. by 8½-in. page in seven seconds. The 132-column format can be printed without character compression or reduced resolution. A 16 by 24 character cell provides 384 points to define a character. New V-80 options include

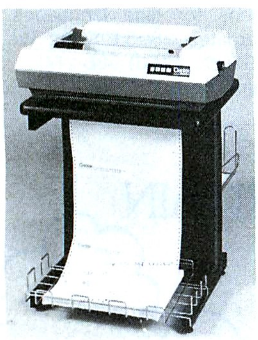


RS-232C serial interface, long line drivers and receivers, underline capability, 96 ASCII character sets in three fonts (Gothic, Roman or Courier), 124-character set for scientific/engineering applications, and plug-in PROM configurations for nine languages. Price: $8,500. Versatec, 2805 Bowers Ave., Santa Clara, CA 95051, (408) 988-2801.
CIRCLE INQUIRY NO. 310

Bi-directional dot matrix printer is designed to serve hard-copy output needs of multifunctional information processing systems. For business tasks, the Dual-Mode 200 provides printing speeds of 165-200 characters per second in a 9 by 9 dot matrix. In word

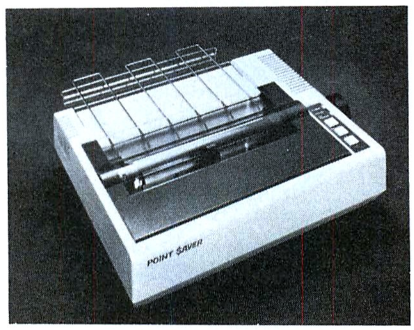
processing mode, the Dual-Mode 200 prints 42-70 characters per second in a 19 by 18 dot matrix, using a unique precision dual-pass technique. Price: $2,995. Malibu Electronics Corp., 2301 Townsgate Rd., Westlake Village, CA 91361, (805) 496-1990.
CIRCLE INQUIRY NO. 312

Dot matrix impact printer is microprocessor-controlled and provides safeguard against loss of data with its standard 2K-byte message buffer expandable to 4K bytes. The standard 2K allows printing of a full CRT



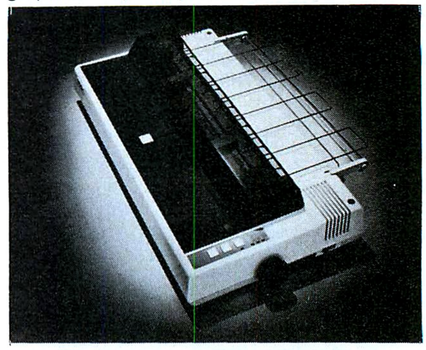
(1920 characters) screen without restraint pauses. The printer can accept 80 more characters after generation of a restraint signal. The series 6010 printer operates at print speed of 150 characters per second with a 9 by 9 dot matrix for high quality printing. The printer is available with a Centronics compatible parallel or an RS-232 serial interface operating at the maximum baud rates up to 19,200 baud. Additional features include adjustable page length from 3 in. to 22 in. in ½-in. increments; vertical tabs (4 or 6 lines) and fixed horizontal tabs at columns 1, 9, 17, 25, etc.; and automatic skip fold selectable at 0, 4 or 6 lines. Price: $1,550. Qantex Div., North Atlantic Industries, Inc., 60 Plant Ave., Hauppauge, NY 11787, (516) 582-6060.
CIRCLE INQUIRY NO. 313

Dot matrix printer can be configured to operate in conjunction with a remote terminal or as a remote slave port using a multiport communication adapter. The Point-$aver printer has additional line buffering allowing baud rate selections up to 9600 when used in the CTS mode. The bidirectional printing



allows up to 132 columns in the compressed mode. Standard features include compressed, graphics, emphasized, double strike, and double width modes. Foreign language characters are available in easily interchangable modules. Price: $769. D & O Leasing, 22361 Peralta Dr., Laguna Hills, CA 92653, (714) 581-0333.
CIRCLE INQUIRY NO. 314

Dot matrix printer, the 136-column MX-100, uses dot matrices ranging from 9 by 9 to 18 by 18 to generate correspondence quality printing in a total of 12 different character weights and sizes. The printer also features Epson's Micro-Nine disposable print head, and Graftrax, a high resolution bit image graphics capability, as standard features.

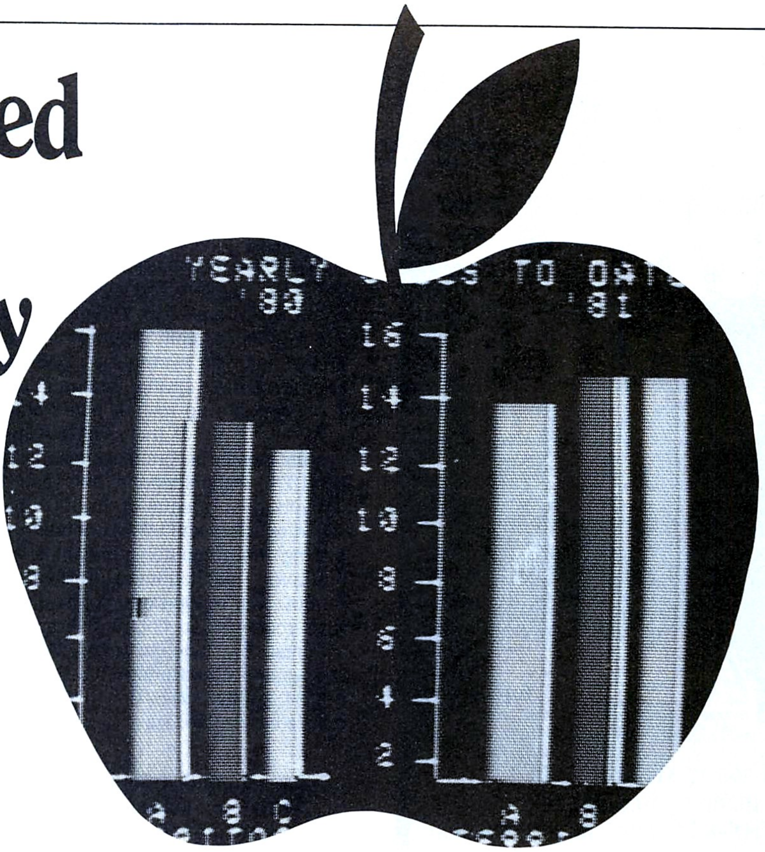


Because the printer accepts paper up to 15.5 in. wide, it is capable of printing up to 233 columns of information in the condensed print mode. It prints bidirectionally at 80 cps, with a logical seeking function to minimize print head travel time and maximize throughput. Price: $995. Epson America, Inc., 23844 Hawthorne Blvd., Torrance, CA 90505, (213) 378-2220.
CIRCLE INQUIRY NO. 315

SYSTEMS

Compact word processing system is designed for easy adaption to any office space. Two micro floppy disk drives are built right into the keyboard. With foot control and headphones as optional accessories, the series 35 functions as a transcriber as well

as a text editor. The system consists of a base work station (17 by 15 by 5 in., 15.4



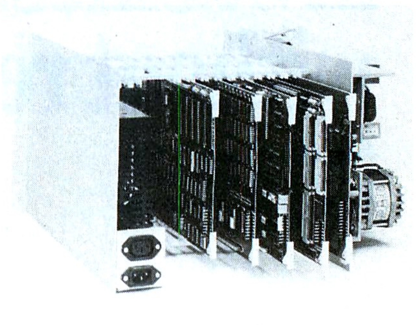
lbs.) and a 15-in. B/W full page display unit and high speed letter quality printer. The system uses microcassettes. Price: $9,000. Sony, 9 W. 57th St., New York, NY 10019, (212) 371-5800.
CIRCLE INQUIRY NO. 317

Multi-user microcomputer, the ACS 8000-10, combines 10M bytes of hard-disk storage with floppy disk or magnetic tape back-up media. The Z80-based system integrates the Altos single-board computer and DMA controller with an 8-in. Winchester hard disk into a compact unit. Mounted in a standard 19-in. rack, the system has 208K bytes of internal RAM, giving enough power to accommodate up to four users and expand with the needs of the small business. The system has six programmable serial ports, an RS432 communications port and handles network data rates at up to 800K baud. It is based on CP/M and MP/M operating systems, making the computer compatible with most end-user (applications) software. Price: $8,500 with single-sided floppy disk, $9,500 with double-sided floppy disk and $10,990 with magnetic tape cassette. Altos Computer Systems, 2360 Bering Dr., San Jose, CA 95131, (408) 946-6700.
CIRCLE INQUIRY NO. 318

Desktop business computer, Xerox 820, is also a soft-loaded text editor. Basic components are the display/processor, keyboard, and dual 5¼-in. disk drives. Optional hardware components are a Xerox 630 printer and dual 8-in. disk drives. Current software includes word processing, CP/M, Teletype communications, M Basic, C Basic-2, Cobol 80, M Sort, and an electronic worksheet package. Ethernet compatibility is provided through the previously announced Xerox 872/873 communications servers. The 820 can also use the Xerox 871 interactive communications emulator for 3270-mode access to a host computer. Both the CP/M operating system and 3270 emulation are now available also for the Xerox 860 information processing system. The 820 display and processor are housed in a single unit. A 12-in. screen displays white characters on a dark background and has a capacity of 24

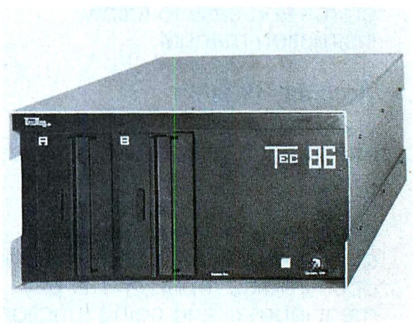
80-character lines. The screen is flicker-free and includes a control for the operator to adjust brightness. The 820 has a 2.5 Mz microprocessor with 64K RAM and 4K ROM. The basic system includes dual RS232 serial ports, one for the printer and one for communications. Dual parallel ports are also standard. Price: $2,995. Xerox Corp., Office Products Div., 1341 W. Mockingbird Ln., Dallas, TX 75247.
CIRCLE INQUIRY NO. 319

Microcomputer systems meet the needs of system integrators and OEM designers to develop fluent, transportable, and customized programs in Pascal for professional, business and industrial applications. Because Pascal is its *native language*, the Modular Micro-Engine eliminates assembly language, interpreters, and the problems of forcefitting programs and applications into computer architecture not efficient for Pascal. Each of the five boards in the ME1600 microcomputer



implements a distinct and vital system function: processing, storage, file management, I/O, and user access to Western Digital's Sentinel/24 bus. The heart of the series, the ME1660 subsystem includes a Pascal processor, a 128K-byte dynamic RAM module, a floppy disk controller, a serial-parallel I/O controller, a boot terminator module, and a 10-slot chassis with 170 watt power supply. Western Digital Corp., 3128 Red Hill Ave., P.O. Box 2180, Newport Beach, CA 92663, (714) 557-3550.
CIRCLE INQUIRY NO. 320

Microcomputer systems include the 8086 CPU with vectored interrupts, 64K bytes of dynamic RAM or 32K bytes of static RAM with RAM expandable to 1M byte, two RS232 serial ports, three 8-bit parallel ports, EPROM boot for CP/M-86, double density floppy disk controller, dual 8-in. Shugart floppy disk drives, all metal enclosure, power supplies



and cabling. The Tec-86 belongs to a line of S-100 8086 bit systems. The Tec-86W includes an additional 31M-byte Winchester hard disk drive and 256K bytes of RAM. Software available for these systems includes CP/M-86, Microsoft Basic-86, and Pascal/M86. Prices: Tec-86, $3,990; Tec-86W, $9,990. Tecmar, Inc., 23600 Mercantile Rd., Cleveland, OH 44122, (216) 464-7410.
CIRCLE INQUIRY NO. 322

Home computer console, TI99/4A, an enhancement of the TI99/4, improves the ease-of-use and functionality of the computer. Upper and lowercase letters, numbers, punctuation, and symbols are arranged as on a standard typewriter keybord. The shift key activates the uppercase letters and can be locked by depressing the alpha lock key. Keys have been added to simplify the access

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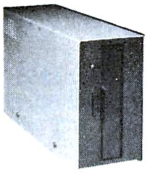

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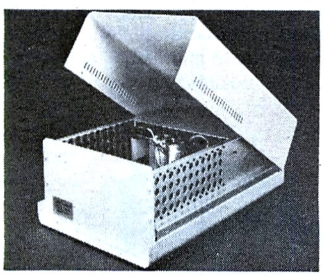
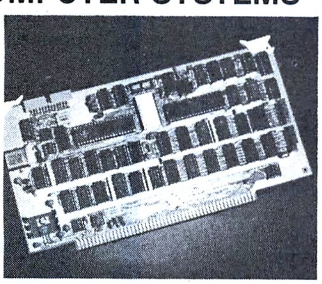
S-100 CALIFORNIA COMPUTER SYSTEMS





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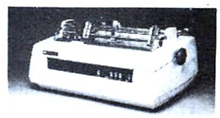
PRINTERS



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Microline 80	Friction, and pin & tractor feed			$ 500
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PRINTER SPECIAL

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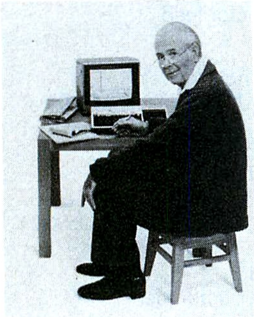
to special computer functions. For example, the function key, along with designated number keys, allow access to such functions as Begin, Aid, Proc'd, Redo, and Back. Crtl is a special control key used in telecommunications applications such as communicating with another home computer or with a remote home information service. Memory resident



in the system is 72K bytes organized as 26K bytes of internal instruction memory (ROM), up to 30K bytes of ROM in each plug-in solid state software command module, and 16K bytes of data storage memory. Price: $525. Texas Instruments Inc., Consumer Relations, P.O. Box 53, (Attn: TI99/4 Home Computer Console), Lubbock, TX 79408, (800) 692-4279.
CIRCLE INQUIRY NO. 323

Micro-Mainframe computer combines the power and languages available on mainframe systems with the low cost of microcomputers. Applications developed on the system can be up-loaded to a mainframe system and executed without modification. The system currently supports the following interpretive languages: Waterloo MicroBasic, Waterloo MicroPascal, Waterloo MicroFortran and Waterloo MicroAPL. Cobol is under development. The Waterloo MicroEditor is included for creating and maintaining both programs and source data files. Disk-oriented Assembler and Linker programs are included to support development of general purpose Motorola 6809 machine-language programs. The computer is based on the standard Commodore Business Machines model 8032 microcomputer, featuring an integrated green phosphor 12-in. display, 73-key typewriter style keybord with standard upper/lower case, numeric keypad, and full cursor control. The Micro-Mainframe is a pseudo 16-bit 6809 based system with 36K ROM, 96K user RAM and 2K screen RAM that supports all current CBM peripherals except the C2N cassette recorder. A powerful facility is included which supports the standard RS232C interface with speeds up to 9600 baud. Communication software is provided that controls baud rate. Commodore Business Machines, Inc., Computer System Div., 681 Moore Rd., King of Prussia, PA 19406, (215) 337-7100.
CIRCLE INQUIRY NO. 324

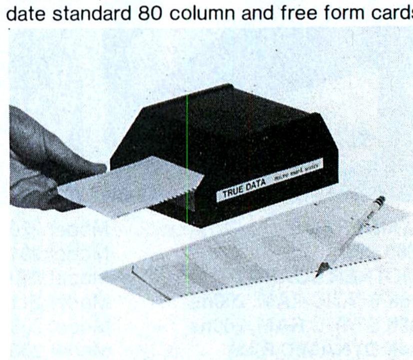
Virtual memory computer offers such features as virtual memory and compressed data storage. The system utilizes bit-slice technology to outstrip the processing speed of normal micros, and the starter configuration consists of a single-user processor with 1 million characters of floppy disk storage. Micropower may be upgraded to MCM's full Power system, which is the company's multi-user distributed processor offering. A full range of small business and corporate software is available with the system. It is designed to compete in price with Radio Shack and Apple. MCM Computers Ltd., Suite 600, 6700 Finch Ave. W., Rexdale, Ontario, Canada M9W 5P5, (416) 675-1353.
CIRCLE INQUIRY NO. 325

Portable computer, the Datamac 1255, is self-contained and packages a Z-80 processor, 64K bytes of RAM, I/O ports, keyboard, CRT, and two 5¼-in. double-sided double-density minifloppies into a cabinet no bigger than a normal CRT terminal. The industry standard CP/M operating system is offered along with software, including Basic, Fortran, Cobol, Pascal, Forth, macro-

assemblers, business packages, text-editors, word processors, and utilities. Features include an alternate control and display screen. This allows the user to display or alter memory and registers. Prices: $2,995 to $4,995. Datamac Computer Systems, 3333-F Octavius Dr., Santa Clara, CA 95051, (408) 727-0561.
CIRCLE INQUIRY NO. 326

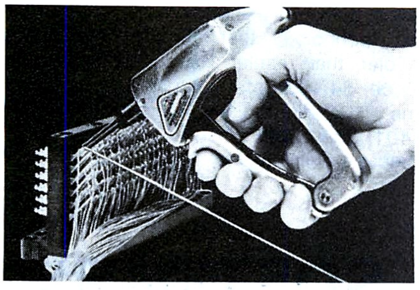
TOOLS/TEST

Optical card reader, Micro Mark I, for low cost data and program statement entry in microcomputer environments can accommodate standard 80 column and free form cards



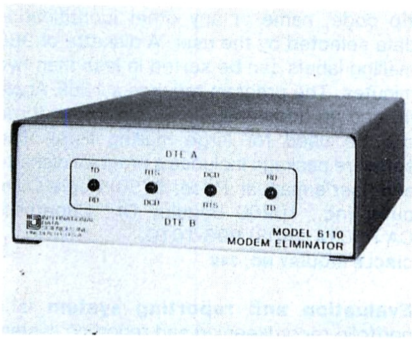
marked with number two pencil or punched. Price: $900 with serial interface, $1,200 with full parallel port. True Data Corp., 17092 Pullman St., Irvine, CA 92714.
CIRCLE INQUIRY NO. 327

Speed wrap tool, G200/R3278, produces solderless wire wrapped connections by merely squeezing the trigger. The hardened steel working parts ensure long life and trouble-free service. It is enclosed in Lexan housing, enabling the tool to be light weight. Designed for production line and field service use in the electronic, telecommunications and appliance industries. O.K.



Machine and Tool Corp., 3455 Conner St., Bronx, NY 10475.
CIRCLE INQUIRY NO. 328

Modem eliminator is designed to allow for the interconnection of data terminal equip-

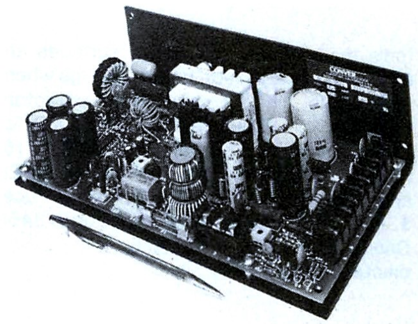


ment without modems. It can be used in either synchronous or asynchronous modes and with terminals configured for half or full-duplex operation. Features of the model 6110 include internal strap selections for constant or controlled RTS, four selectable RTS/CTS delays, internal or external clock, and nine clock rates ranging from 1200 to 19,200 bps. The DTE interface conforms to EIA RS-232-C and CCITT V.24 specifications. Price: $370. International Data Sciences, Inc., 7 Wellington Rd., Lincoln, RI 02865, (401) 333-6200.
CIRCLE INQUIRY NO. 330

DC voltage calibrator is fully IEEE-488 bus compatible, offers a ten to one improvement in zero stability and a two to one enhancement in accuracy over a similar unit previously manufactured. The 2701A is based on a super-linear digital attenuator scheme which permits direct CPIB amplitude programming via logic to logic interface. The six dial, LED display design permits digit carry and digit borrow to eliminate the mentally taxing

transfer from all 9s to a decade value. Standby and ranging memory allow the user to go to zero or change ranges without losing the six digits of programmed output amplitude. Price: $1,895. Valhalla Scientific, Inc., 7576 Trade St., San Diego, CA 92121, (714) 578-8280.
CIRCLE INQUIRY NO. 331

Power supply is designed for the power requirements of Winchester drives. The 24V output of the model AC-160 power supply has a separate return for noise reduction and can deliver up to 7 amps for starting the drive motor. Other outputs are +5.0V-12A, −5V-3A, +12V-1.5A, and −12V-1A. All output voltages are ±5% under normal loads except the +12V out. The +12V



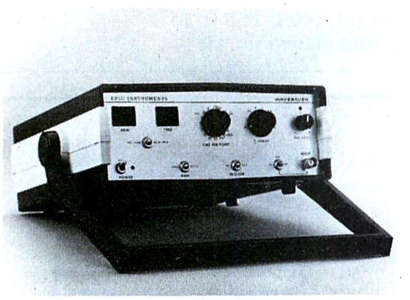
regulation is ±0.5% and is intended to drive a CRT. The unit also has a 120VAC output for a fan. The input ranges are user changeable from 80-140VAC to 160-264VAC. The model AC-160 has a power O.K. signal and an on-board RFI filter to VDE standards. It will be submitted to UL 478, CSA 22.2#144 and VDE 0730. 100-piece price: $304. Conver Corp., 10629 Bandley Dr., Cupertino, CA 95014, (408) 255-0151.
CIRCLE INQUIRY NO. 332

CIRCLE INQUIRY NO. 104

DIP IC extractors and inserters, WK-7, accommodate all ICs from 14-40 pins. All

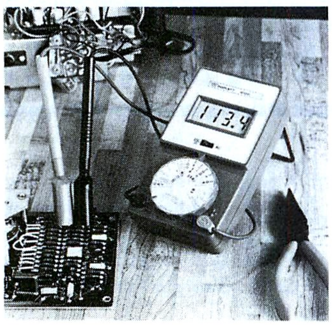
tools that engage conductive surfaces are CMOS safe and include grounding lugs where appropriate. The kit consists of extractors EX-1 for 14-16 pin devices, and EX-2 for 24-40 pin chips, plus inserters MOS-1416, MOS-2428, and MOS-40 for 14-16, 24-28 and 36-40 pin ICs respectively. Price: $34.95. O.K. Machine and Tool Corp., 3455 Conner St., Bronx, NY 10475.
CIRCLE INQUIRY NO. 333

Waveform recorder can record analog signals for display on any oscilloscopes, most chart recorders, or through a digital output interface to a computer system. As a buffer between the circuit under examination and the display oscilloscope, the Wavesaver records signals into a solid-state



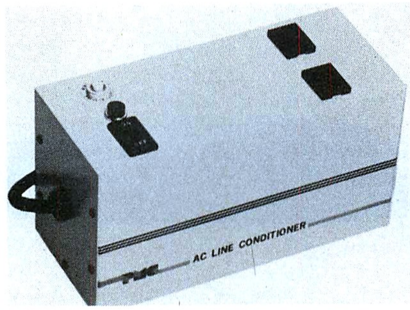
memory with its single-shot recording technique. This allows storage of either random signals or repetitive waveforms and displays them continuously on any oscilloscope. Price: $495. Epic Instruments, Inc., 551-G Foster City Blvd., Foster City, CA 94404, (415) 574-9081.
CIRCLE INQUIRY NO. 334

Digital multimeter, model 3450, has a special ohms range with audible continuity



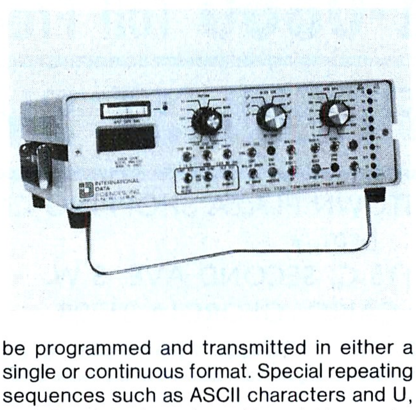
tone and displays immediate resistance reading with no range change needed and has a 0.15% basic DC accuracy. The 3½ digit digital multimeter with ½-in. LCD display also features both Hi and Lo power ohms; overload protection up to 1,000 volts with special 2A/250V fuse arrangement; no nuisance fuse blows in volt and ohm ranges. A range selector switch permits the model 3450 to be operated with only one hand, selects: 0-1000 VDC or VAC in five ranges, 0-20 megohms resistance in six ranges and 0-2000 mA AC or DC current in 4 ranges. Price: $150. Triplett Corp., One Triplett Dr., Bluffton, OH 45817, (419) 358-5015.
CIRCLE INQUIRY NO. 335

AC line filter with built-in transient surge suppression is for use with microcomputers, microprocessors, microprocessor-based scientific laboratory instrumentation, and



sensitive electronic and audio equipment. It features 70 dba common mode and differential mode noise attenuation in the RFI frequency range from 150 KHz to 30 MHz, the noise range most troublesome to computers and computer-based instrumentation. It also features built-in transient surge suppression of spikes to 6000 amps max. at 50 Joules energy absorption. PMC Industries, Inc., 1043 Santa Florencia, Solana Beach, CA 92075, (714) 481-7422.
CIRCLE INQUIRY NO. 338

Data test set is designed to analyze the error rate of any digital transmission network. It can be used to test synchronous, asynchronous, or start/stop character-oriented systems such as time division multiplexers. Bit, character, and block error rates are determined by transmitting pseudo-random test patterns over the communications channel. These test patterns are statistically optimum and accurately simulate computer-generated data. A start/stop character can



be programmed and transmitted in either a single or continuous format. Special repeating sequences such as ASCII characters and U, and Baudot characters R and Y can be generated to meet specific user requirements. The model 1320 TDM-Modem test set is designed using the latest state-of-the-art technology that operates faster and cooler than eariler Range Rider models. Price: $4,145. International Data Sciences, Inc., 7 Wellington Rd., Lincoln, RI 02865, (401) 333-6200.
CIRCLE INQUIRY NO. 339

SOFTWARE

BUSINESS

Mail list manager program turns the Apple III into a flexible mailing list management tool. The program enables Apple III users to store, sort, edit and print mailing labels and phone lists in their entirety, or selectively by zip code, name or any other identification data selected by the user. A diskette of 960 mailing labels can be sorted in less than two minutes. The program requires a 128K Apple III, and an additional disk drive (up to three can be used for large mailing lists). The software package includes a program diskette and user's manual. Price: $150. Apple Computer Inc., 10260 Bandley Dr., Cupertino, CA 95014, (408) 996-1010.
CIRCLE INQUIRY NO. 340

Evaluation and reporting system is a portfolio recordkeeping and reporting system for stockbrokers and other investment professionals. Its unique file structure means that securities information is entered only once and can be changed on all portfolios with a single entry. Pear contains all the features of a complete transaction recordkeeping system, including automatic pricing from Dow Jones, matching of proceeds and cost basis by tax lot, automatic adjustment of positions for stock splits, and fully formatted portfolio appraisal, unrealized gain and loss, realized gain and loss, and investment income reports. The system requires an Apple II computer with 48K bytes of memory, dual 5¼-in. floppy disk drives, a 132-column printer, and the D.C. Hayes microdem. A version for use with the Apple communications card and acoustic coupler is available on a special order basis. Price: $500. Pear Systems, 27 Briar Brae Rd., Stamford, CT 06903.
CIRCLE INQUIRY NO. 341

Graphing program for the TRS-80 computer model I level II and the model III Basic graphs equations in the form Y = mx + b and Y = f(x) and is ideal for math students and technical people. It can graph simple formulas, multiple equations, summation, etc. The axis is automatically scaled for the size of the screen display. There is a LPRINT option for the program to support a lineprinter. Unique error handling routines are included to handle tricky equations. The program has manual or automatic range selection. This program, with user's manual, is easy enough to use for even amateur computer users. Price: $19.95. David L. Modney, 4144 N. Via Villas, Tucson, AZ 85719.
CIRCLE INQUIRY NO. 342

Accounting package includes a fully integrated passive payroll, virtually unlimited user-defined income statement formats, ledger consolidation (merges up to ten

companies), a work-in-process sub-ledger, both budget and prior year comparisons, three levels of departmental summaries, multiple current-earnings accounts, client transmittal letters and batch processing reports. Client Ledger System is interactive and easy to use. It features flexible chart of accounts setup and unique password access for security. The system is fully departmentalized and provides balance sheets and income statements with subsidiary schedules, a detailed trial balance (annual detail optional), transaction registers sorted by account number or by source and reference, cash flow statement, amortization schedules complete with rule of "78." The CLS requires an 8080, 8085 or Z-80 microcomputer with the CP/M operating system (2.X version), Microsoft Basic-80 (5.X version) and 56K of user-available memory. TCS Corp., P.O. Box 47550, Atlanta, GA 30362, (404) 455-6162.
CIRCLE INQUIRY NO. 343

Word processing software has been added to the Artelonics series 1000 microcomputer-based work station at no extra cost as a standard part of the system. The software contains new features such as combined document format sets, permitting tabs to be set within each of the four individual margin sets and allowing the user to obtain a greater range of formatted pages within a document; wide-page display and print; and indented paragraphs as well as recording of international date convention in addition to the standard domestic method. Document integrity has also been enhanced. Artelonics Corp., 2952 Bunker Hill Ln., Santa Clara, CA 95050, (408) 727-3071.
CIRCLE INQUIRY NO. 344

Tax planning program will compute 1981 income and social security taxes as well as 1980 and 1979. The update is based on tax laws in effect as of January 1, 1981. The program will be revised whenever the tax laws are changed. The Shortax program runs on most types of CP/M systems that use Microsoft's Basic-80 (MBasic) release 5.0 or later, and will run on Apple computers with the appropriate CP/M modification. It also operates on the Radio Shack TRSDOS systems (models I, II or III) and on Micropolis disk operating systems using the Micropolis disk extended Basic. Use of the program requires a CPU with at least 48K bytes and at least one disk drive. Under CP/M a few systems may require 56K bytes of CPU memory. According to the company, the program is also being converted to run on a Pertec 2000 system and the Apple disk systems. Price: $500. Syntax Corp., 4500 W. 72nd Terrace, Prairie Village, KS 66208, (913) 362-9667.
CIRCLE INQUIRY NO. 345

Personal financial system keeps records of all checks written for the year, recaps checks by the month, by payee or by category. You can print a snapshot graph or a graph by category or by payee. $Cash$ will give you a detail of all checks written into several categories. Keeps records of medical expenses, interest, taxes, contributions and miscellaneous deductions for income tax records. It also lets you control your expenses for automobile, clothing and accessories, insurance and utilities. It helps keep your budget in line. 32K and two disk drives are required. Price: $55. Omni Software Systems, Inc., 146 N. Broad St., Griffith, IN 46319, (219) 934-3522.
CIRCLE INQUIRY NO. 346

Insurance agency management system is designed for the small to medium agency. This system allows a base of 999 different types of coverage codes to be set up by the user, with full description and standard premium rates charged by each company. Numerous insurance companies can be stored in the system, with the exact agency commissions payable for each type of coverage. Agency and producer files are also maintained, with MTD, YTD and LYTD commissions earned, and percentages payable of agency net commissions. The Policy Files are fully cross-referenced with client, company, producer, and coverage code files and also include policy number, effective date, expiration date, brief overall description, name of insured (if different from client), a manual rating system (upgradeable later to an automatic rating system) is incorporated, and up to eight different types of coverages may be combined into a single policy, with computer-calculated totals. For all CP/M microcomputers using CBasic-2. Price: $950. Univair Inc., 10327 Lambert Int'l Airport, St. Louis, MO 63145, (314) 426-1099.
CIRCLE INQUIRY NO. 347

Graphics program enables Apple II and Apple II Plus users to see a multidimensional object from any angle. It can be used by architects to design buildings, by drafting professionals to prepare plans and scientists to conduct experiments. Apple-Graphics II enables the user to call up a full screen view of any portion of a drawing, with no degradation of picture quality, for detailed study.

CIRCLE INQUIRY NO. 109

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GBT 160U	UnKit	$225.00
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2810 Z80 CPU-CA. COMP. SYST.
2/4 MHZ Z80A CPU with RS-232C Serial I/O Port complete with Monitor PROM for 2422 Disk Controller

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2/4 MHZ will accept 2716, or 2732, or RAM RUN/STOP and single step switches

SSMCB2K	Kit	$260.00
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CB1A 8080 CPU - S.S.M.
8080CPU, 1K RAM, Holds 1 2708, 1 8 Bit parallel input port.

SSMCB1A	Kit	$183.00
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SSM8080M	SM 8080 Monitor	$59.00

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64K STATIC RAM - GODBOUT
RAM 17, 10 MHZ, 2 Watt, DMA Compatable

GBT-175A48	A&T 48K	$950.00
GBT-175C48	CSC 48K	$1050.00
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4 MHZ, on board refresh, DMA compatable, 24 bit address.

CCS-2065A	A&T	$599.00

32K STATIC RAM - GODBOUT
RAM 20 10 MHZ, 4K byte block disable, available 16, 24, or 32K

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GBT-164C16	CSC 16K	$418.00
GBT-164A24	A&T 24K	$449.00
GBT-164C24	CSC 24K	$539.00
GBT-164A32	A&T 32K	$499.00
GBT-164C32	CSC 32K	$720.00

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4 MHZ, Bank select, 8/16 bit data

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RAM 14, 10 MHZ, 24 bit addressing

GBT-143A	A&T 16K	$169.00
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4 MHZ, 8/16 bit data, bank select

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programs 2708 or 2716's, operates as a 4K/8K EPROM board as well.

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16K x 8 EPROM Board using 2708, Power on jump to any 256 byte

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DMA, Soft Sector, Controls 8" or 5¼", single or double density

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GBT CPM80	CP/M 2.2 for Z80/8085 with Manuals & BIOS 8" S.D. disk	$175.00
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CCS-2422	A&T with CPM 2.2 8" S.D.	$365.00

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Single density disk controller with serial I/O, controls 8"

MDSDJ1108	A&T	$219.00

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MDSDJ2208	A&T	$375.00

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Single sided double density most popular 8" drive

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Dual 8" drive cabinet with power supply. Rack or Desk Mount

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GBT-162C	CSC	$460.00
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I/O Multiplexer, using 8085A-2 cpu on board

GBT-166A	A&T	$450.00
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INTERFACER I - GODBOUT
Two Serial I/O

GBT-133A	A&T	$219.00
GBT-133C	CSC	$298.00

INTERFACER II - GODBOUT
Three parallel, one serial I/O board

GBT-150A	A&T	$219.00
GBT-150C	CSC	$298.00

MULTI I/O - MORROW DESIGNS
Three Serial, Two parallel

MDSMB3200	A&T	$309.00

SWITCHBOARD-MORROW DESIGNS
Two serial I/O, four parallel I/O, one status port, one strobe port

MDSSB2411	A&T	$239.00

I/O2 - SSM
One parallel input, one parallel output, proto work area

SSMI02K	Kit	$69.00
SSMI02A	A&T	$89.00

I/O4 - SSM
Two serial I/O, two parallel I/O

SSMI04K	Kit	$210.00
SSMI04A	A&T	$260.00

SBI-SSM
Music synthesizer board

SSMSBIK	Kit	$249.00
SSMSBIA	A&T	$310.00
SSMSBIS	Software	$ 25.00

S-100 VIDEO BOARDS

SPECTRUM - GODBOUT
Color Graphics board with Parallel I/O.

GBT-144U	UnKit	$299.00
GBT-144A	A&T	$349.00
GBT-2D	Sublogic Software	$ 35.00

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80 x 24 or 48 character video display Memory Mapped, Parallel Keyboard port

SSM-VB3K24	Kit 80x24	$349.00
SSM-VB3A24	A&T 80x24	$429.00
SSM-VB3UP	Upgrade Kit	$ 30.00

VB2 - SSM
I/O Mapped Video Board, with Parallel Keyboard port. 64x16

SSM-VB2K	Kit	$169.00
SSM-VB2A	A&T	$229.00

VBIC - SSM
Memory Mapped Video Board 64x16 character display or 64x16 graphics dislplay

SSM-VBICK	Kit	$169.00
SSM-VBICA	A&T	$220.00

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MOTHERBOARD - GODBOUT
Active termination, 6-12-20 slot

GBT-153U	Unkit 6 slot	$ 89.00
GBT-153A	A&T 6 slot	$119.00
GBT-154U	Unkit 12 slot	$129.00
GBT-154A	A&T 12 slot	$149.00
GBT-155U	Unkit 20 slot	$174.00
GBT-155A	A&T 20 slot	$189.00

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MDS1200A	A&T 12 slot	$149.00
MDS2000A	A&T 20 slot	$199.00

S-100 MISC.

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OB1 VECTOR JUMP - SSM
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System requirements for the software are an Apple II or Apple II Plus computer with 48K bytes of memory, Apple language system, a video display unit and a disk drive. The addition of a plotter adds hard copy capability to the system. Price: $95. Apple Computer Inc., 10260 Bandley Dr., Cupertino, CA 95014, (408) 996-1010.
CIRCLE INQUIRY NO. 348

Word processing package integrates data processing and word processing capabilities in a single system that fully meets most of the information processing needs on Rexon's small business computer systems. On-Word affords users of RX15, RX20-2, and RX30-2 systems a simple and convenient way to create, edit, store, and print business documents quickly and accurately. The package implements such basic editing functions as line insert, delete, and restore; page, paragraph, and sentence repositioning; centering of headings; generation of leader dots; right-margin justification; paragraph assembly; decimal alignment; and horizontal scrolling. Price: $2,000. Rexon Business Machines Corp., 5800 Uplander Way, Culver City, CA 90230, (213) 641-7110.
CIRCLE INQUIRY NO. 349

Management application package is based on critical path network analysis techniques that have previously been available only on large minicomputer systems. These same techniques are now available for smaller projects commonly encountered in business, government, engineering and construction projects. Unlike earlier PERT/CPM programs for large mainframe computers, Milestone is interactive — it immediately displays the results of a scheduling change on the terminal screen. It is available for microcomputers such as Apple, TRS-80, and many S-100 systems using CP/M 86, CP/M, or UCSD Pascal operating systems. It requires an 80 by 24 screen and 56K of RAM. Price: $295. Organic Software, 1492 Windsor Way, Livermore, CA 94550, (415) 455-4034.
CIRCLE INQUIRY NO. 352

Statistical analysis system for the Apple II performs the data manipulation and statistical analyses most needed in academic and marketing research. The program builds self-descriptive data files on the disk, then recalls variables by a "virtual memory" process as they are referenced by the user. Up to 11,000 data points may reside in memory at once, allowing a maximum of over 4,000 cases in analysis. Sub-setting, transformation, missing data and case weight are supported. Statistics include: mean, variance, distributions, histograms, two-way tables (with Chi-square), Pearson and rank correlation, pair and standard t-tests, Anova, and multiple linear regression. Aida uses provisional means algorithms for accuracy of variances and cross-products, and computes significance levels. Data may be input from text files, or through an enter and verify routine. It requires 48K with Applesoft, and at least one Disk II; works with Corvus. Price: $235. Action-Research Northwest, 11442 Marine View Dr., S.W., Seattle, WA 98146, (206) 244-9360.
CIRCLE INQUIRY NO. 353

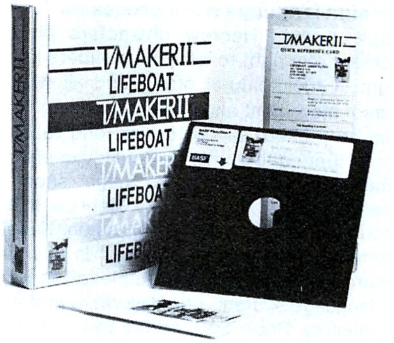
Personal finance program is designed to help the user plan and analyze a budget. The system's power also gives the user the ability to perform complex expense analyses or forecast trends. Most common financial tasks, such as checkbook balancing, check lookup and simple budgeting are standard with the system. The database orientation of the system allows the user to perform operations on financial information without having to re-enter the data each time a new operation is called for. The information is stored on a diskette and is readily accessible. The system requires the use of an Atari 800 with 32K of RAM and the Atari 810 disk drive. Price: $74.95. Atari Inc., 1265 Borregas Ave., P.O. Box 427, Sunnyvale, CA 94086.
CIRCLE INQUIRY NO. 354

Legal time accounting package manages the business side of a law firm. LTA keeps track of client files, matter files and associated log entries, which represent services performed for individual matters. It automatically posts log entries to the appropriate matter and prints individualized statements according to nine criteria. The package handles about 500 active clients, 1,500 matters and 2,500 open log entries. It was designed for firms with up to ten lawyers. It runs on the Commodore model 8032 microcomputer with a Commodore model 8050 dual floppy disk drive and will support the Commodore model 4022 dot-matrix printer or a properly interfaced letter quality printer. Price: $595. Commodore Business Machines, Inc., 681 Moore Rd., King of Prussia, PA 19046, (215) 337-7100.
CIRCLE INQUIRY NO. 355

Scoring system for bowling league secretaries runs on a 32K Pet with disk and printer and will handle scratch and handicap bowling leagues with up to 24 teams. A smaller version which will handle 12 teams in a 16K Pet using cassette data storage is also available. Entry of weekly scores results in a scored and handicapped printed summary. Features include disk records, accuracy, and extensive editing. Provisions are included for forfeits, blinds, partial absences, snapout errors, postponements, team ties, individual ties, subs, name changes, drops, ineligibles, messages, display of secretary's lane, and lane assignment anywhere in a 98-lane house. Handicapping is selectable and accurate at 21 games whenever reached, and printed output will be correct on any printer that will give an ASCII program listing. Designed for the non-computer-oriented secretary, the program handles handicap, scratch, mixed, men's and women's leagues per ABC rules. Price: $40. Harry H. Briley, P.O. Box 2913, Livermore, CA 94550.
CIRCLE INQUIRY NO. 356

Inventory purchasing module that was added to the Apple Accounting Plus II package supports 1,000 inventory items per volume. Details include part number description, unit of measure, product group, unit cost, unit price, stock value of each part and total stock value for all parts. Reports available are master parts listing, stock status report, stock status detail, inventory analysis, transaction register, transaction summary, order recommendations, on order report, surplus on order report, and out of stock report. Modules are fully integrated requiring data to be only entered once. The system provides hard disk implementation allowing for a maximum of 10,000 records per data file. Systems Plus, 3975 E. Bayshore, Palo Alto, CA 94303, (415) 969-7047.
CIRCLE INQUIRY NO. 357

Financial reporting package, T/Maker II, was designed especially for use in professional offices and small businesses. It combines advanced numerical data processing features with word processing controls. It can be used on CP/M-equipped microcomputers. In addition, the package contains automatic



functions, such as transcendentals and logarithms, for scientific applications. The complete software package includes the disk, an instructional manual (with tutorial) and a quick reference card. Lifeboat Assoc., 1651 Third Ave., New York, NY 10028, (212) 860-0300.
CIRCLE INQUIRY NO. 358

Office appointment package maintains a record of appointments for up to 27 people in nine groups of three, for an unlimited time in the future. Datebook is designed for any situation where time/management is critical to office efficiency. The operator works from a main option menu that appears at the bottom of a display of the day's appointments. Menu items include: appointment, scheduling, cancelling, modifying, and rescheduling; scheduling a conference; searching for all appointments for a specified person; scanning for openings that satisfy a set of arbitrary constraints; inspecting appointments for days in the future; and printing a day's appointments. The program was written in Pascal and is available to run on CP/M and the new CP/M 86, as well as UCSD Pascal systems. Price: $295. Organic Software, 1492 Windsor Way, Livermore, CA 94550, (415) 455-4034.
CIRCLE INQUIRY NO. 360

Word processing package features simultaneous printing and editing to increase office productivity. WordStar is able to align numeric information in columns. This decimal tab feature automatically lines up the decimal point whenever requested. It uses on-screen menus to show commands available. Six different menus are available to explain such things as document formatting or print commands. The built-in video monitor of the Z-89 will display as many as 21 lines of text. Other features include: boldface, double strike, strikeout, subscript, superscript, overprint and accent entry. The word processor runs under the CP/M operating system and on a Z-89 or H-89 with 48K bytes of RAM but the simultaneous printing and editing feature requires 64K. Price: $395. Zenith Data Systems, 1000 Milwaukee Ave., Glenview, IL 60025, (312) 391-8181.
CIRCLE INQUIRY NO. 361

Plug-in card enables users of Apple II and Apple II Plus personal computers to run turnkey programs written in any Apple-supported language, including Pascal, Fortran and Pilot. The Language Card provides an additional

16K bytes of general-purpose RAM, increasing the size of the Apple II internal memory from 48K to 64K bytes. Price: $195. Apple Computer Inc., 10260 Bandley Dr., Cupertino, CA 95014, (408) 996-1010.
CIRCLE INQUIRY NO. 362

Foreign language word processor for the Apple II puts Hebrew characters on the screen from right to left (and numbers left to right in their natural order) and allows full cursor movement and character editing. Text can be printed, saved to disk, and recalled for further editing. It is particularly useful for labeling any Apple hi-res page such as charts, maps, and pictures. Hebrew II can produce graph labels, press-on labels, memos, posters and practice in learning Hebrew. For Apple II with Applesoft in ROM or language system, one disk drive and 48K of memory. Price: $60. Aurora Systems, Inc., 2040 E. Washington Ave., Madison, WI 53704, (608) 249-5875.
CIRCLE INQUIRY NO. 363

EDUCATION/GAMES

Library of disks is used on the Apple II, each available in 3.2 or 3.3 DOS. The advantage of this software is that each menu driven disk includes a series of programs designed to aid the teacher in the creation and implementation of lessons. They may be altered, modified, stored or deleted, without programming skills. The disks are offered in a variety of subjects such as computer programming, spelling, history, biology, chemistry and astronomy. The procedure for designing a lesson involves answering questions set forth by the computer. The Teacher Create series encompasses three formats, question and answer, sentence structure and spelling, and testing. Price for each disk ranges from $24-$32. Educational Courseware, 3 Nappa Ln., Westport, CT 06880.
CIRCLE INQUIRY NO. 364

Learning program is designed for children in kindergarten through third grade. Spelling Bee has three objectives: 1) develop computer literacy, allowing very young children to interact comfortably with the computer; 2) establish new vocabulary by linking the abstract verbal symbol (word) to the concrete (picture); 3) build basic spelling skills while identifying specific groupings. The program's high resolution graphics and musical sound effects capture a child's interest. A system generator allows the parent or teacher to tailor the system to an individual child's needs. The system requires Applesoft, 48K, and DOS 3.3. Price: $29.95. Edu-Ware Services, Inc., 22222 Sherman Way, Suite 203, Canoga Park, CA 91303, (213) 346-6783.
CIRCLE INQUIRY NO. 365

Learning system is a software product for the generation of computer aided instruction courses on microcomputers. With the Eureka learning system, teachers may develop CAI courses of their own design, without any knowledge of programming. The menu-driven text writer program displays all options available to the teacher at each step in the development process. The text that is developed by the teacher is then presented to the students through the use of the Educator program, which is the system's other main component. The system provides special symbols and graphic presentation as well as text. A guide shows teachers how to use the system and develop three courses. Eiconics, Inc., 200 Cruz Alta, Taos, NM 87571, (505) 758-1696.
CIRCLE INQUIRY NO. 366

Classroom record-keeping program for the 16K TRS-80 model I or model II computer does not require programming or complicated computer background. Teachers type the class list into the Classfile program and follow the directions and the grade and student names are stored on cassette. These can later be changed or updated. This process is accelerated by a high speed data saving routine. Each Classfile can contain up to 35 students, each with 25 grades. It allows the teacher flexibility to weigh grades in averaging, enter new grades, change old grades, add extra credit, or add students to the class roster. The program allows the teacher to display on the screen or if a printer is available print the following information: a list of all students in a class and their grades, a list of all students whose grade falls below some cut-off point, a list of all students and averages in rank order by average. It will also display the class average and may also list the average of any one student by name. Price: $19.95. TYC Software, 40 Stuyvesant Manor, Geneseo, NY 14454, (716) 243-3005.
CIRCLE INQUIRY NO. 367

Improved reading skills are possible with Compu-Read 3.0 in Atari Basic. It contains a series of instructional modules which build learner's skills by strengthening the perceptual processes essential to competent reading. Both the Atari and Apple systems require 48K and disk drive. The system is available on Atari cassette. Price: $29.95. Edu-Ware Services, Inc., 22222 Sherman Way, Suite 203, Canoga Park, CA 91303, (213) 346-6783.
CIRCLE INQUIRY NO. 368

Sneakers are little guys who appear to be friendly but will quickly stomp you out if you do not get them first. After the sneakers come wave after wave of Cyclops, Saucers, Fangs, H-Wings, Meteors, Scrambles and Scrubs. Sneakers was written entirely in assembly language, will operate on a 48K Apple II or II + with disk drive, and is playable with keyboard or paddle. Price: $29.95. Sirius Software, Inc., 2011 Arden Way #225A, Sacramento, CA 95825, (916) 920-1939.
CIRCLE INQUIRY NO. 369

Color Invaders for the Radio Shack Color Computer has you at the controls of the Space Tank, firing at stellar ships and invading critters. Invading ships burst in air with explosive noise. Alien critters march across the screen, dropping bombs and screaming as life is zapped from their fried little bodies. Each of the 8 levels of play present additional complications, keeping the beginner going and the experts challenged. Price: $19.95. Computerware, Box 668, 1472 Encinitas Blvd., Encinitas, CA 92024, (714) 436-3512.
CIRCLE INQUIRY NO. 370

Fantasy role-playing system, the Sword-Thrust, for the Apple II lets you begin as a naive novice. If you can survive "The King's Testing Ground" you may attempt "The Vampyre Caves," "Kidnapper's Cove," or other quests yet to come. The experience and treasure you gather in one adventure will help you in the next. Your will be living under a complete and consistent system of combat and sorcery. CE Software, 801 73rd St., Des Moines, IA 50312, (515) 224-1995.
CIRCLE INQUIRY NO. 371

Arcade game lets you drive your car through a maze avoiding the computer foe out to get you. The better you get, the faster the action... And when you're ready, challenge two cars at the same time. There are 12 game options for up to 4 players in this real-time game of skill and reflex. It requires 16K and joysticks. Price: $22.95 (disk or cassette) plus $3 for postage and handling. Synapse Software, 820 Coventry Rd., Kensington, CA 94707.
CIRCLE INQUIRY NO. 372

Psychotherapist program analyzes each statement as you type it in and then responds with its own comment or question. Response time is virtually instantaneous and the remarks are often startlingly appropriate. Eliza runs on any CP/M based microcomputer system with at least 40K of RAM. Supplied as a 34K .COM (machine language) file on a standard 8-in. diskette, the program is being offered for a limited time at $25. Artificial Intelligence Research Group, 921 N. La Jolla Ave., Los Angeles, CA 90046, (213) 656-7368.
CIRCLE INQUIRY NO. 373

Overland adventure, the Dragon's Eye, has animated graphics. The player has 21 game days to find the Dragon's Eye, a magical jewel hidden in one of seven provinces. In another game, the player assumes the role of the monster in more than 100 possible scenarios. As any of the six man-eating beasts, the player must satisfy his enormous appetite by eating his opponents. Automated Simulations Inc., P.O. Box 4247, Mountain View, CA 94040.
CIRCLE INQUIRY NO. 374

Strange creatures are appearing and some have been reported stealing people from the surface of the Earth. As a fighter pilot you must defend the planet by destroying these creatures and saving the people who are being carried away. But do not run into these creatures or let their "Smart Eggs" hit you or you will explode. Gorgon is written fully in assembly language and features pause, restart, and sound control keys, as well as some of the fastest color graphic routines ever programmed. It requires an Apple II or II + with disk drive and 48K, and it uses either a 13 or 16 sector controller. Price: $39.95. Sirius Software, Inc., 2011 Arden Way #225A, Sacramento, CA 95825, (916) 920-1939.
CIRCLE INQUIRY NO. 375

Critical decision-making game, Empire of the Overmind, allows one to satisfy a lifelong dream...that of being a hero. Each game contains a poem, The Rhyme of Overmind, which tells the story of Alcazar's downfall. It must be read carefully because it contains many useful clues. After that you're on your own to finish the story. As the hero you make the critical decisions. The computer provides friends in surprising places. With their help, strategy and a little luck, one can solve the puzzle and defeat the Overmind. It runs on

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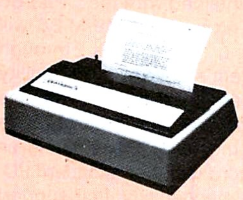

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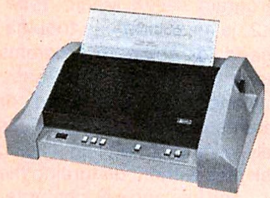

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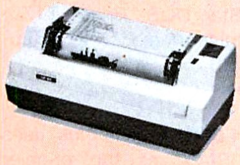

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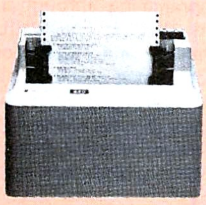

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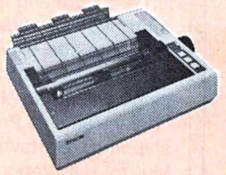

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TRS-80 II, Apple II and Atari 800. Price: $30. The Avalon Hill Game Co., 4517 Harford Rd., Baltimore, MD 21214, (301) 254-5300.
CIRCLE INQUIRY NO. 376

Invasion game is the first 1K game of its type for the Sinclair ZX80 personal computer. Super ZX80 Invasion features continuous moving graphics in the 1K version. The game engages the player in battle against space invaders attacking in battle formation. The player defends the ship by maneuvering left and right and firing lasers at the invaders. A hit by the invaders decreases the number of lasers the player's ship has available. If the ship is destroyed by the invaders, the game will automatically reset and the battle begins again. Price: $14.95 plus $1.50 shipping. Softsync, Inc., P.O. Box 480, Murray Hill Station, New York, NY 10156.
CIRCLE INQUIRY NO. 377

Competitive game, RobotWar, incorporates the logic of systematic computer programming into the fundamental strategy of the game. The RobotWar player writes a special Battle Language program which gives his or her robot its individual personality. This language controls such things as the robot's radar, laser cannon, speed and position. On the Robot Test Bench, the player has a cybernetic window into the robot's mind to check that the program is performing as planned. The game requires an Apple II or II plus computer with 48K, Applesoft ROM and disk drive running 3.2 or 3.3 DOS. Complete documentation and RobotWar Club membership application are included. Price: $39.95. Muse Software, 330 N. Charles St., Baltimore, MD 21201.
CIRCLE INQUIRY NO. 378

Hero game for the Atari 800 allows the player to experience life in a world of ancient legends, fearsome monsters, and spectacular treasures, as he becomes a hero in search of fame and fortune. With Temple of Apshai he can take the part of more than fifteen million characters the computer can generate, or alternatively, a veteran of previous adventures. If the player wishes, the same character can return to the dungeon again and again, growing in power and experience, as long as he continues to survive. The display keeps the player up to date on the outcome of his encounters with the 30 types of monsters that roam freely through more than 200 rooms on four levels of ruins. The game includes a fully illustrated 48-page book. Price: $39.95. Automated Simulations, Inc., P.O. Box 4247, Mountain View, CA 94040.
CIRCLE INQUIRY NO. 379

SYSTEMS

Operating system modification to the TRS-80 model II allows fully transparent use of rigid disk drives, such as the Corvus Winchester drive and Cameo cartridge drive. Up to 98 volumes, or logical drives, may be used, although it is possible to treat the hard disk as a single volume or drive. Cordos has facilities for password protection for the full drive, as well as a volume level password protection. Basic programs will generally run with no modification, allowing the user the advantage of the speed and reliability of a rigid disk drive, without the disadvantages of rewriting existing application programs. American Business Computers, 118 S. Mill St., Pryor, OK 74361, (918) 825-4844.
CIRCLE INQUIRY NO. 380

Multi-user operating system, MP/M-86, is based on the CP/M and MP/M operating systems for 8-bit microcomputers. Full compatibility is maintained with the CP/M-86 single-user operating system. MP/M-86 will support networking capabilities through CP/NET. The system's shared code facility allows multiple users to execute programs with only one copy of the object code resident in main memory. Other features include file and record lock-out, standard I/O, and internal queue mechanisms that support mutual exclusion, pipes, synchronization and communication between multiple tasks. Digital Research, 801 Lighthouse Ave., Pacific Grove, CA 93950, (408) 649-3896.
CIRCLE INQUIRY NO. 382

Word processing and database management in one program called Magic Typewriter version 2.2, is an all-purpose tool that eliminates the need for separate programs for separate tasks. As a word processor, almost all commands are one word or mnemonics. Features include: moving blocks of text, selectively loading or deleting, finding material from disk files without disturbing the file in memory, and swapping character strings in one line, a block of lines, or throughout the entire text with a single command. A sophisticated line editor for inserting or deleting characters is also included. As a database management system, the program allows the user to customize the system to his own needs by the rapid sort and can scan either an entire record or specific fields within a record. The system uses 11K of Z80 code. It is available for both CP/M and North Star DOS. Price: $175. California Digital Engineering, P.O. Box 526, Hollywood, CA 90028.
CIRCLE INQUIRY NO. 383

Software for Atari 800, Access Plus, uses Basic A+ and OS/A+ as the premier products to promote total access through the computer. Basic A+ maintains compatibility with Atari Basic while adding simple but powerful access to the system of Player/Missle Graphics. Features of Basic A+ include: print using, record I/O, and binary I/O; structured programming through IF.. ELSE..ENDINF and WHILE..ENDWHILE; improved string handling; and much more. OS/A +, a system command processor, allows both batch and interactive commands along with a selection of disk file utilities. Optimized Systems Software, 10379 Landsdale Ave., Cupertino, CA 95014, (408) 446-3099.
CIRCLE INQUIRY NO. 384

Overlay linking loader, Lynx, is for Microsoft's Fortran, Cobol and Macro-80. It is a friendly overlay linker because it features simple commands and a complete HELP function and will also work with other language translators to produce Microsoft compatible relocatable files such as the Basic Compiler. It allows the construction of programs that use all available memory. As a result, programs that have reached the maximum size allowed by Microsoft's L80 linker can be increased in size a minimum of 9K using the loader without overlays. It

requires a CP/M compatible operating system. Price: $250. Westico, 25 Van Zant, Norwalk, CT 06855, (203) 853-6880.

CIRCLE INQUIRY NO. 385

Cobol program generator for Z-80 based computers will function in an identical manner as Quaydata's Basic program generator, taking full advantage of the dynamic screen generating capabilities of the Control/Access package. User modifiable code is produced in minutes for nearly any data entry application. The code generated is directly compatible with the Oasis Ryan-McFarland Cobol. The package takes advantage of the dynamic screen generator utility in Control/Access, and allows full cursor addressing, protected fields and automatic format and cross reference file validation. Quaydata, Inc., 2415 15th St., Suite 301, Denver, CO 80202, (303) 433-5476.

CIRCLE INQUIRY NO. 386

Database manager, T.I.M. (Total Information Management) is menu driven with plain English prompts and error messages. This simplifies operation for computer novices without degrading performance. The program includes 16 main commands with many sub-commands including selective record retrieval and report and list generation. A separate program, TIMMAIL, allows several word processors such as WordStar and Magic Wand to read T.I.M. files. This enables the user to easily generate form letters using these programs. T.I.M. is written in Microsoft Basic and is available either interpretive or compiled running under CP/M or one of its derivatives. Innovative Software, 8176 Nieman Rd., Lenexa, KS 66214, (913) 888-0154.

CIRCLE INQUIRY NO. 387

Pascal development system is for CP/M applications. Designed specifically for the systems integrator, applications software developer and serious end users, the package offers cache Bios for CP/M, utilizing the DMA and interrupt capabilities of Intersystems series II disk controller and memory boards to buffer whole tracks in extended memory, thus reducing I/O and increasing execution speed up to four times. Pascal/Z is also offered. It is a fast Z-80 native code compiler that generates ROMable and Reentrant object code, relocatable object modules and permits separate compilation. And, because there is no interpreter, Pascal/Z programs run 5-10 times faster than identical code run under interpretive P-code implementations. The front end mainframe, a sophisticated diagnostic tool, allows the user to examine or change any location in memory; set breakpoints in data, address or status; single- or slow-step through programs, and permits the system to be used for both hardware and software development. Price: $7,995. Ithaca Intersystems, Inc., 1650 Hanshaw Rd., Ithaca, NY 14850.

CIRCLE INQUIRY NO. 388

Word processing system, Spectra-Text, is color-enhanced. It can be used as a small business system, as well. The system is menu-driven and fully interactive—as with other sophisticated systems. Absolutely no knowledge of computers is required to operate the software. Some standard features include: dedicated function keys, selective and global search and replace, block move/copy, document merge and Spectra-Calc—the program that allows the user to perform math with on screen processing. Intelligent Systems Corp., 225 Technology Park, Norcross, GA 30092, (404) 449-5961.

CIRCLE INQUIRY NO. 389

Fortran language is available for use with the Convergent family of desktop computers. Object code modules produced by the Fortran compiler can be linked with other modules written in Assembly language and Pascal, together with other modular software building blocks including Convergent's Forms Facility, ISAM, and Sort/Merge. Convergent Fortran is an implementation of the Subset level of the ANSI Standard for Fortran 77, X3.9-1978. The language is further enhanced to include Hollerith formats for Fortran 66 compatibility, multiple named COMMONs using full megabyte address spacing, integer *2, integer *4, and error handling on I/O. Price: $2,000. Convergent Technologies, 2500 Augustine Dr., Santa Clara, CA 95051, (408) 727-8830.

CIRCLE INQUIRY NO. 390

Multi-user Cobol provides up to 16 different operators with automatic record locking and file locking security in a Cobol environment. Release 1.3 insures increased protection and data integrity, offering automatic record locking and file locking as standard features. Other features of the Oasis Cobol option include the one-pass compiler, interactive debugger, and multi-keyed ISAM file structure capability. Other features include unique flexibility in maintaining public, private or shared files; user accounting controls; convenient inter-user communications; text editor and script processor; and Print Spooler. Comprehensive program development support offered by Oasis includes high-level Basic interpreter and compiler with re-entrant run-time module, EXEC interactive job control language; relocating macro assembler/debugger/linkage editor; and diagnostic/conversion programs. Price: $750 for the complete system and $250 for only the run-time module. Phase One Systems, 7700 Edgewater Dr., Suite 830, Oakland, CA 94621, (415) 562-8085.

CIRCLE INQUIRY NO. 393

High level language, Energy Basic, is designed to simplify the implementation of energy management systems and similar applications requiring the monitoring of time, elapsed time, temperature, kilowatt demand, digital inputs, and the control of devices based on such information. It is an interpreter providing the Basic language constructs including FILL, FOR, GOTO, GOSUB, IF, INPUT, LET, LIST, NEXT, OUT, PRINT, RETURN, REM, RUN, STOP, WAIT, ABS, CALL, EXAM, INP, RND and SIZE. The language supports a primary system console device, an optional system printer, and an optional originate/answer modem. It is available as a development system running under CP/M 2.2 on 8-in. floppy diskette (P/N EB080) or resident on two 2716 type PROMs for dedicated control applications. For the PROM version of Energy Basic (P/N EB010), the application program may also reside in 2716 type PROM. International Data Systems, P.O. Box 17269, Dulles International Airport, Washington, DC 20041, (703) 661-8442.

CIRCLE INQUIRY NO. 394

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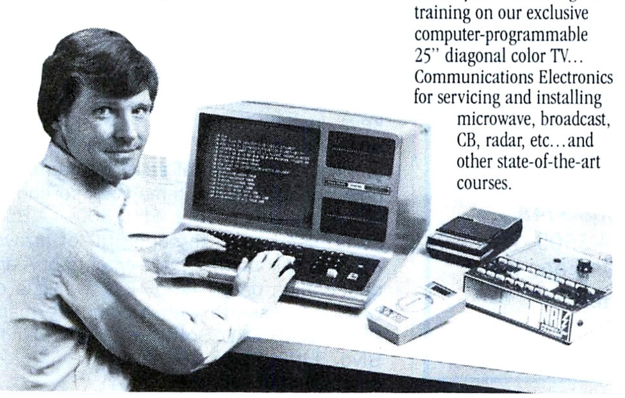

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171-101

Cross-compiler program for the Forth language provides a convenient method to implement Forth on a target computer, or to extend/modify it on a host computer. It will automatically forward reference any word or label. It can produce headerless code. It can produce ROMable code with initialized variables. It also has a load map, as well as a comprehensive list of undefined symbols. Machine readable versions are available for the following hardware systems: CP/M, TRS-80 model I, H-89, and North Star. Each version includes: (1) an executable version of fig-Forth model 1.0; (2) the cross-compiler source code; (3) the cross-compilable source; and (4) complete documentation. Price: $200 plus $10 shipping. Nautilus Systems, Box 1098, Santa Cruz, CA 95061, (408) 475-7461.
CIRCLE INQUIRY NO. 395

UTILITY

Printer driver package implements all of the bells and whistles on the Diablo and Qume printers. With Ddrivr, you can do underscore, boldface, or both. Superscripts and subscripts are possible. The driver comes with complete source code on 8-in. single density, soft sectored CP/M compatible floppy disk. Source code is supplied in Digital Research ASM assembler format. Thus, it can be assembled with either ASM or the Microsoft MAC-80 macro assembler. The driver is relocatable. It automatically loads itself into high memory when brought up on the system. It has complete handshaking routines built in, making it possible to use the printers at 1200 baud. Standard versions of the package run under the Digital Research CP/M operating system. Price: $29.95. Waltek, 7100 Chapman Dr., Ft. Worth, TX 76180, (817) 498-4594.
CIRCLE INQUIRY NO. 396

Pascal utility package, Pup I, designed specifically for the Apple Pascal 1.1 environment has the following features: moves Basic files (Applesoft, Integer, text, binary) to a Pascal disk; sets system date at boot (automatically if you have a Mountain Hardware Clock); produces printer-formatted listings of Pascal text files; supports Pascal wildcards; 40/80 column formats; upper and/or lower case; user modifiable Basic tokens; error checking with understandable diagnostic messages; single or multi-drive operations; on-line user assistance; full user documentation; easy to use by Pascal beginners. Price: $29.95. Gryphon Microproducts, P.O. Box 6543, Silver Spring, MD 20906.
CIRCLE INQUIRY NO. 397

Software driver allows the user to dump the contents of the high resolution pages out to the Epson-MX-80 printer to obtain hard copy graphics. The options for printing are presented in menu fashion. The user must know what type of printer interface card is being used and which slot number it is in. The eight types of interface cards that are supported are listed on the beginning menu. They are Apple's parallel/Centronics, Epson parallel, Apple serial, Apple communications, California Computer System's serial, and California Computer System's parallel (models 7720A, 7720B, and 7728). Price: $44.95. Computer Station, 11610 Page Service Dr., St Louis, MO 63141, (314) 432-7019.
CIRCLE INQUIRY NO. 398

Textwriter for users of the Applewriter and Supertext word processing systems allows the user to: convert files generated under Applewriter to files accessible by Supertext; convert files generated under Supertext to files accessible by Applewriter; convert standard text files into files accessible by either Supertext or Applewriter; convert Applewriter or Supertext files into standard text files. Users wishing to convert files generated by one word processor to be accessed by the other may do so with ease. This utility is of particular value to those users who wish to use their word processing system to edit information obtained from one of the communications networks (e.g. The Source), as well as those who wish to use a modem to transmit over the phone lines files created by one of the word processors. Price: $49.95. Mint Software, 3662 Peggy Dr., Baton Rouge, LA 70806, (504) 766-2318.
CIRCLE INQUIRY NO. 399

CP/M interface allows Basic programs compiled with the Comstar compiler to run under the CP/M operating system. The CP/M interface includes modifications to the Comstar library routines, a North Star-CP/M transfer routine, and a module that maps the North Star DOS into the CP/M environment. Price: $75 for registered owners of the Comstar compiler for version 5.2 North Star Basic. Allen Ashley, 395 Sierra Madre Villa, Pasadena, CA 91107, (213) 793-5748.
CIRCLE INQUIRY NO. 400

General-purpose tool for the TRS-80 prepares tables of data or spreadsheets. The computer screen is the spreadsheet. A fast cursor is used to enter data or labels at the desired location. Preprogrammed operators are used to accomplish calculations on lines, columns, or cells of the spreadsheet. The results of the calculation can be output to a printer for professional-looking tables. The input can also be printed to provide a record of the calculation method. Data and instructions can be saved to tape or disk. It operates in the input mode to specify data and operators. The spreadsheet is organized into horizontal and vertical pages. Variable formatting of data and labels of columns and lines is available. User-defined operators can be added to the program. Three versions are available: tape or 16K model I or III ($34.95), tape for 32/48K model I or III ($64.95), and disk for 48K model III ($67.95). Dan G. Haney & Assoc., Inc., P.O. Box 687, San Mateo, CA 94401.
CIRCLE INQUIRY NO. 401

Machine langauge utility to sort up to 25 one-dimensional Applesoft arrays with seven keys in any combination of ascending or descending order while maintaining the parallel association of array elements brings new capabilities to in-memory sorting. The simple statement CALL SR,0,500, – A,B$,C% sorts elements 0 through 500 of arrays A, B$, and C% so that the elements of A are in descending order. ASORT is available on a DOS 3.3 diskette with a complete manual. Price: $30. C&D Software, 1516 Fair Park Blvd., Little Rock, AR 72204.
CIRCLE INQUIRY NO. 402

CALENDAR

Oct 2-3 Classroom Applications of Computers, Independence High School, Santa Clara, CA, conference including hands-on tutorial sessions for teachers with several different hardware types at several levels of sophistication; also workshops and industrial exhibits of hardware and software. Don McKell, Independence High School, 1776 Educational Park Dr., San Jose, CA 95133, (408) 288-7642.

Oct 7-21 Far East Consumer Electronics Tour, Japan, South Korea, Taiwan and Hong Kong are the sites for these trade shows. The tours will include briefings by government and industry leaders, facility tours and individual business appointments. Terry Butler, Commerce Tours International, 870 Market St., Suite 742, San Francisco, CA 94102, (415) 433-3072.

Oct 12-15 Info 81, New York Coliseum, New York, NY, discussions and data on increasing the responsiveness of information systems, including hardware and software exhibits. Clapp and Poliak, 245 Park Ave., New York, NY 10167, (212) 661-8410.

Oct 16-17 Computers in Education Conference, Education Building, University of Saskatchewan, Saskatoon, Canada, workshops and lectures on aspects of educational computing, geared for grade levels K-12. Duncan Campbell, Mount Royal Collegiate, 2220 Rusholme Rd., Saskatoon, Canada.

Oct 17-18 Educational Software Symposium, Stouffer's Inn, White Plains, Westchester County, New York, NY, displays of educational software, seminars, panels and user interest group meetings. Queue, Inc., 5 Chapel Hill Dr., Fairfield, CT 06432.

Oct 24 New Jersey Microcomputer Show and Fleamarket, Holiday Inn (N.) Convention Center, Newark Airport, Newark, NJ, over 100 vendors of microcomputer equipment and user group meetings of many popular systems. Kengore Corporation, 3001 Route 27, Franklin Park, NJ 08823, (201) 297-2526.

Oct 26-28 Digital Electronics course, Virginia Tech campus, Blacksburg, VA, workshops on digital electronics for automation and instrumentation, including hands-on experience, wherein the participant designs and tests concepts with the actual hardware. Dr. Lindy Leffel, C.E.C., Virginia Tech, Blacksburg, VA 24061.

Oct 31-Nov 1 Computers in Ambulatory Medicine, Sheraton Hotel, Washington, DC, joint annual conference of the Advanced Medical Systems and the Society for Computer Medicine. SCM, 9650 Rockville Pike, Bethesda, MD 20014, (301) 530-7120.

Nov 2-4 Mini/Micro Conference and Exposition, Convention Center, Anaheim, CA, equipment exhibitions and discussions on large and small computer systems. Mini/Micro Exposition, 32302 Camino Capistrano, Suite 202, San Juan Capistrano, CA 92675.

Nov 3-5 National Electronic Packaging and Production Conference, San Mateo Fairgrounds, San Mateo, CA, latest developments in the machinery, equipment, tools, hardware and supplies utilized for prototype circuit design/packaging, PCB production, and PCB/Microelectronics testers. Cahners Exposition Group, 222 W. Adams St., Chicago, IL 60606.

Nov 5 Invitational Computer Conference, Marriott Hotel, Amsterdam, The Netherlands, display of products including printer/plotters, floppy disks, Winchesters and other disk drives, streaming and conventional tape drives, interface and controller products, power supplies, terminals, minicomputers and microcomputers. Also held Nov 12 at Hotel Sofitel, Severes, Paris, France and Nov 17 at the Hotel Executive, Milan, Italy. B.J. Johnson & Assoc., 2503 Eastbluff Dr., Suite 203, Newport Beach, CA 92660.

Nov 8-10 American Computer Chess Championship, Bonaventure Hotel, Los Angeles, CA, annual championship tournament will include two four-round sessions. Assoc. for Computing Machinery, 1133 Ave. of the Americas, New York, NY 10036.

Nov 9-10 Software Fair, Stouffer's Riverfront Towers, St. Louis, MO, exhibitions by software suppliers with systems in current use by wholesalers and distributors of hard goods sold to commercial and industrial users. National Industrial Distributors Assoc., 1900 Arch St., Philadelphia, PA 19103.

Nov 10-12 Midcom 81, O'Hare Expo Center and Hyatt Regency Hotel, Rosemont, IL, electronics exposition and convention. Midcon, 999 N. Sepulveda Blvd., El Segundo, CA 90245.

Nov 21-22 Games Faire and AppleFest, Convention Center, San Jose, CA, focusing on electronic products for entertainment and Apple computer-related products. Computer Faire, 333 Swett Rd., Woodside, CA 94062.

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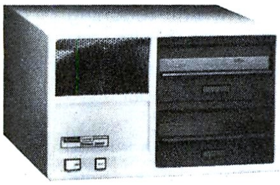

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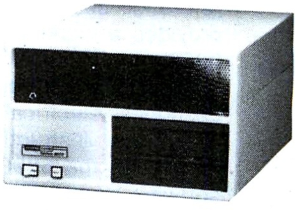
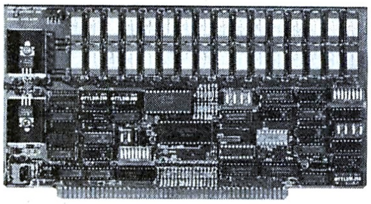


S-100 PRODUCTS



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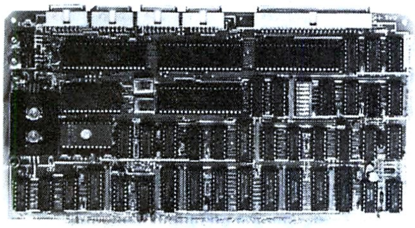

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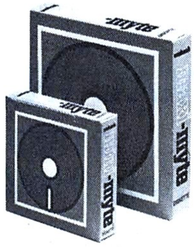

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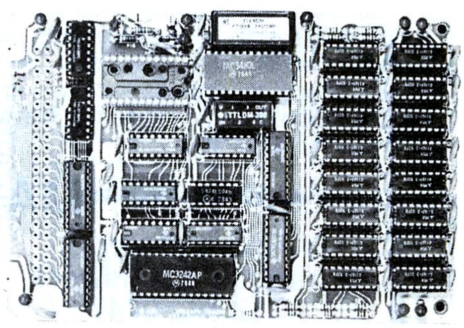

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The MC6809 Cookbook
by Carl D. Warren
Tab Books, Blue Ridge Summit, PA

Reviewed by Dennis Doonan

This book is for both the designer and the experimenter. It is a no-nonsense reference that presents information necessary to design efficient 6809 assembly language programs. While it can be used as a textbook, it is a valuable reference source. Its clear and comprehensive information provides a working knowledge of the fundamentals of the 6809 microprocessor.

Starting with a general description of the 6809, the book describes electrical characteristics, architecture, internal operations, instructions and interfacing. Comparisons are made with the 6800 to show improvements and details of software incompatibilities.

Timing charts and sample programs are used throughout the text. MPU signals are described and traced through their operations. From this overview, 6809 software is examined. Registers and condition codes are described. Tables list the equivalent instructions between the 6800 and the 6809.

Each of the 6809's powerful addressing modes is explained with detailed examples. A reference table lists the instructions and the available addressing modes.

Each instruction of the 6809 is defined in overview and in detail. The bulk of the reference material consists of 52 pages dedicated to presenting an understanding of the instructions, mnemonics, addressing modes and opcodes. This section helps the reader find the most efficient instruction to accomplish a task.

Two final chapters feature the operation of a 6809 assembler and a tiny Basic-like demonstration language.

176 pages $11.95

Data File Programming in Basic
by Leroy Finkel and Jerald R. Brown
John Wiley & Sons, New York, NY

Reviewed by Rocky Smolin

This book is a comprehensive guide to the mysterious world of data files. Most importantly, it is a self-teaching guide, with many review questions and a self-test with answers at the end of each chapter. It will open up a new world of computing—a greatly extended repertoire of functional uses for one's microcomputer.

Before covering the major topic, the authors give a lesson on how to write Basic programs with maximum clarity, readability, and logic—a topic mostly overlooked in programming texts. This is followed by a short but comprehensive review of the Basic statements. The third chapter is concerned with building data entry and error checking routines—an essential prerequisite to the storage of any information in a data file.

The remainder of the book is concerned with the two types of storage and retrieval—sequential and random. The chapter on creating and reading back sequential data files is followed by a lesson on sequential data file utility programs, and how to use the cassette tape player for sequential data storage and retrieval. Two chapters on random access data files and random access file applications round out the discussion.

The applications chapter will give the reader great insight into some of the uses to which these techniques can be put.

 CIRCLE INQUIRY NO. 54

It will whet the appetite and imagination for further exploration into the realm of random access data files. Each chapter contains programming examples—many of which can be adapted to the user's own applications.

The book was written around the most popular dialects of Basic—TRS-80 Basic and Microsoft Basic-80 and the authors have included a special appendix covering North Star Basic. I highly recommend it to anyone interested in expanding his knowledge of the subject of creating and manipulating data files.

338 pages $9.95

Nailing Jelly to a Tree
by Jerry Willis and William Danley, Jr.
Dilithium Press, Beaverton, OR

The authors of this book have approached the topic of computer software by trying to include a little about every topic. Had they defined their audience more narrowly and covered a few topics in greater depth, they would have a more appealing book.

After the introductory chapter, the following one deals with computer math and logic—number systems, codes, etc. Chapter 3 purports to be a review of software common in the field, as well as a rundown of jargon. It is primarily, however, a cursory exploration of a few of the commands of the operating systems or monitors of the Sol operating system, Exidy Sorcerer, TRS-80, T-bug, North Star DOS, and CP/M. There is also a brief discussion of Basic and other higher level languages.

Chapters 4 and 5, which comprise about a quarter of the book, cover machine language and assembly language respectively. However, it is doubtful that anyone needing to alter a machine or assembly language program could do so only with the aid of this book.

Chapters 6 and 7 cover Basic, but only enough to arouse one's curiosity to consult the Basic manual that generally accompanies each manufacturer's machine. Chapter 8, just six pages in length, covers conversion from one Basic to another. The last chapter is a glossary and conversion guide. It appears to be all the keywords from some of the various dialects of Basic along with an explanation of their function. This may, in some cases, aid in the conversion of a Basic program from one version to another. ***—RS***

244 pages $12.95

Introduction to Graphics
by John P. Grillo and J.D. Robertson
Wm. C. Brown Co., Dubuque, IA

In this clearly written and liberally illustrated text, the subject of computer graphics is explored in a methodical and comprehensive fashion.

The book is written around the capabilities of the Radio Shack TRS-80 and the features of the Microsoft Basic implemented on the model I. However, the authors point out that the generalized nature of their discussion makes the graphics techniques presented easily adaptable to other hardware and software.

The authors explore three methods of generating computer graphics. The first, line printer graphics, is generally a set of horizontal lines embedded within a program in the form of print statements.

The second, character graphics, uses the 64 character set of graphic symbols in the Basic character set to create the graphic effects many have seen in computer chess games, Lunar Landers and spaceships, game boards and even schematics.

The third method, pixel graphics, uses the pixel, or picture element, the smallest amount of addressable pictorial area that can be turned on and off under program control.

To demonstrate these various methods, the book includes 38 programs covering a range of applications from pictures of the state of Massachusetts to a diagram of ionic field strength. The authors show how to generate curves, such as sine functions, how to create horizontal and vertical bar graphs, and how to display a moving message banner.

The book not only provides instructive techniques; it is also a source book of ideas that will stimulate the reader to write more interesting, entertaining and useful programs. **—RS**

133 pages $15.95

Pascal Primer
by David Fox and Mitchell Waite
Howard W. Sams, Indianapolis, IN

The object of this book is not just to teach Pascal—it is to teach it painlessly, without tears. This objective is more than realized through a simple, comprehensible, and humorous style. The layout is also conducive to easy learning—large type, lots of illustrations and cartoons. Since Pascal is so English-oriented, all program statements in Pascal are highlighted in orange for easy recognition.

The book proceeds logically after an entertaining introduction, giving a little of the history of Pascal and an explanation of why it's so special. The authors show how to construct simple Pascal programs—the basic input and output statements, variable types, and the concept of the procedure. The remaining chapters expand continuously on the features of Pascal, covering the program control statements—IF/THEN/ELSE, FOR loops, WHILE, REPEAT-UNTIL, and arrays. At the end of the last chapter, the authors 'put it all together' with a tic-tac-toe program that incorporates most of the features of the language.

There is probably no better way to become familiar with Pascal than by reading this excellent book. **—RS**

206 pages $16.95

How To Build Your Own Working Microcomputer
by Charles K. Adams
Tab Books, Blue Ridge Summit, PA

Reviewed by David Civan

This book explains how to build and use a rudimentary computer that can only be programmed in machine code. A cassette recorder, extra displays, more memory, and an RS232 interface can be added to the system.

The book provides fairly complete instructions for assembling the computer, but it leaves much to be desired in terms of readability. It is burdened with excessive jargon.

The book appears unsure about how informed its readers are. It swings between overly simplistic explanations of elementary aspects of computer technology and buzzword-laden technical passages.

There are inexpensive commercial kits that are much better for anyone seeking to experiment with computer circuits. These kits, such as RCA's VIP and Commodore's KIM series, can take Basic and other useful features that the book's computer cannot.

Overall, the book has limited usefulness and reader appeal.

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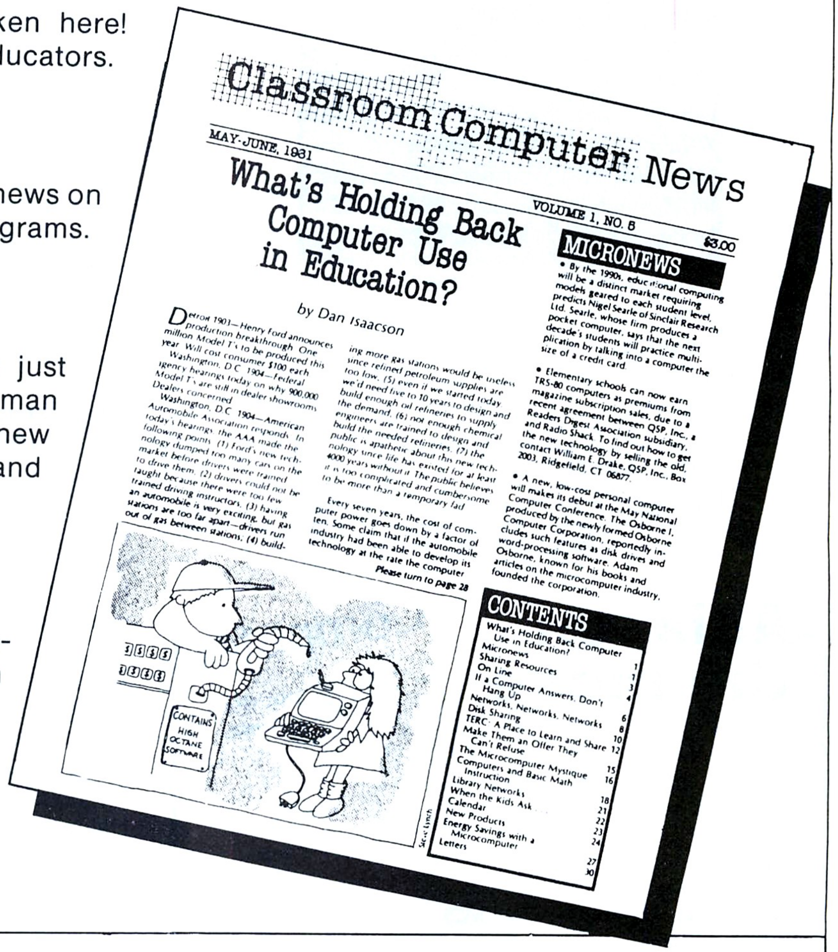

Classroom Computer News

MAY-JUNE, 1981 VOLUME 1, NO. 5 $3.00

What's Holding Back Computer Use in Education?

by Dan Isaacson

Detroit 1903—Henry Ford announces production breakthrough. One million Model T's to be produced this year. Will cost consumer $100 each.

Washington, D.C. 1904—Federal agency hearings today on why 900,000 Model T's are still in dealer showrooms. Dealers concerned.

Washington, D.C. 1904—American Automobile Association responds. In today's hearings, the AAA made the following points: (1) Ford's new technology dumped too many cars on the market before drivers were trained to drive them, (2) drivers could not be taught because there were too few trained driving instructors, (3) having an automobile is very exciting, but gas stations are too far apart—drivers run out of gas between stations, (4) building more gas stations would be useless since refined petroleum supplies are too low, (5) even if we started today we'd need five to 10 years to design and build enough oil refineries to supply the demand, (6) not enough chemical engineers are trained to design and build the needed refineries, (7) the public is apathetic about this new technology since life has existed for at least 4000 years without it. The public believes it is too complicated and cumbersome to be more than a temporary fad.

Every seven years, the cost of computer power goes down by a factor of ten. Some claim that if the automobile industry had been able to develop its technology at the rate the computer

Please turn to page 28

CONTAINS HIGH OCTANE SOFTWARE

MICRONEWS

• By the 1990s, educational computing will be a distinct market requiring models geared to each student level, predicts Nigel Searle of Sinclair Research Ltd. Searle, whose firm produces a pocket computer, says that the next decade's students will practice multiplication by talking into a computer the size of a credit card.

• Elementary schools can now earn TRS-80 computers as premiums from magazine subscription sales, due to a recent agreement between QSP, Inc., a Readers Digest Association subsidiary, and Radio Shack. To find out how to get the new technology by selling the old, contact William E. Drake, QSP, Inc., Box 2003, Ridgefield, CT 06877.

• A new, low-cost personal computer will makes its debut at the May National Computer Conference. The Osborne I, produced by the newly formed Osborne Computer Corporation, reportedly includes such features as disk drives and word-processing software. Adam Osborne, known for his books and articles on the microcomputer industry, founded the corporation.

CONTENTS

Steve Lynch

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Free Literature

Electronic imprinting system designed to coordinate tag and label generation with the user's data management methods is described in an 8-page, full-color brochure. The electronic system, the SPX-10, is available in three operating configurations detailed in the booklet. The model SPX-10/3, a fully intelligent standalone unit, can operate independently; the SPX-10/2 can be controlled through a CRT terminal; and the SPX-10/1, is designed specifically to interface with a computer. Soabar, 7722 Dungan Rd., Philadelphia, PA 19111.

CIRCLE INQUIRY NO. 201

Security management system that performs all major security functions necessary to protect an office or plant is described in a full color brochure. The Dimension 2000 provides television surveillance, alarm monitoring, card key access control and control of security-related building operations. Gordon Crawght, Cardkey Systems, 20660 Bahama St., Chatsworth, CA 91311.

CIRCLE INQUIRY NO. 202

General accounting software package is described in a 1-page brochure. Modules include: general ledger, accounts receivable, accounts payable, payroll, inventory, order processing and job cost accounting. Each can be used either independently or interactively with other modules. Mercator Business Systems, 1294 Lawrence Station Rd., Sunnyvale, CA 94086.

CIRCLE INQUIRY NO. 203

Data monitor, the 801 Mini Fox, is introduced in 6-page color brochure. Special features are identified. Photographs of five sample video displays, including two configuration pages are provided. Technical specifications and ordering information are also included. Halcyon, 1 Halcyon Plaza, 2121 Zanker Rd., San Jose, CA 95131.

CIRCLE INQUIRY NO. 204

Network products are described in 12-page brochure including a full line of network processors and statistical multiplexers. The first section describes the intelligent nodal processors—the 6050 distributed communications processor and 6000 series intelligent network processors. The second section deals with the lower end statistical multiplexers that extend the economies of data concentration and error-free transmission to smaller network nodes. Codex Corp., 20 Cabot Blvd., Mansfield, MA 02048.

CIRCLE INQUIRY NO. 205

Data/word processing accessories are described in 104-page publication. It contains over 2,200 specialty products for data, word processing and microfiche users and 23 pages of compatibility and cross reference charts. This facilitates the finding of the correct ribbon, floppy, cassette, printwheel or thimble for many different makes and models of equipment. American Word Processing Co., 18730 Oxnard St., Tarzana, CA 91356.

CIRCLE INQUIRY NO. 206

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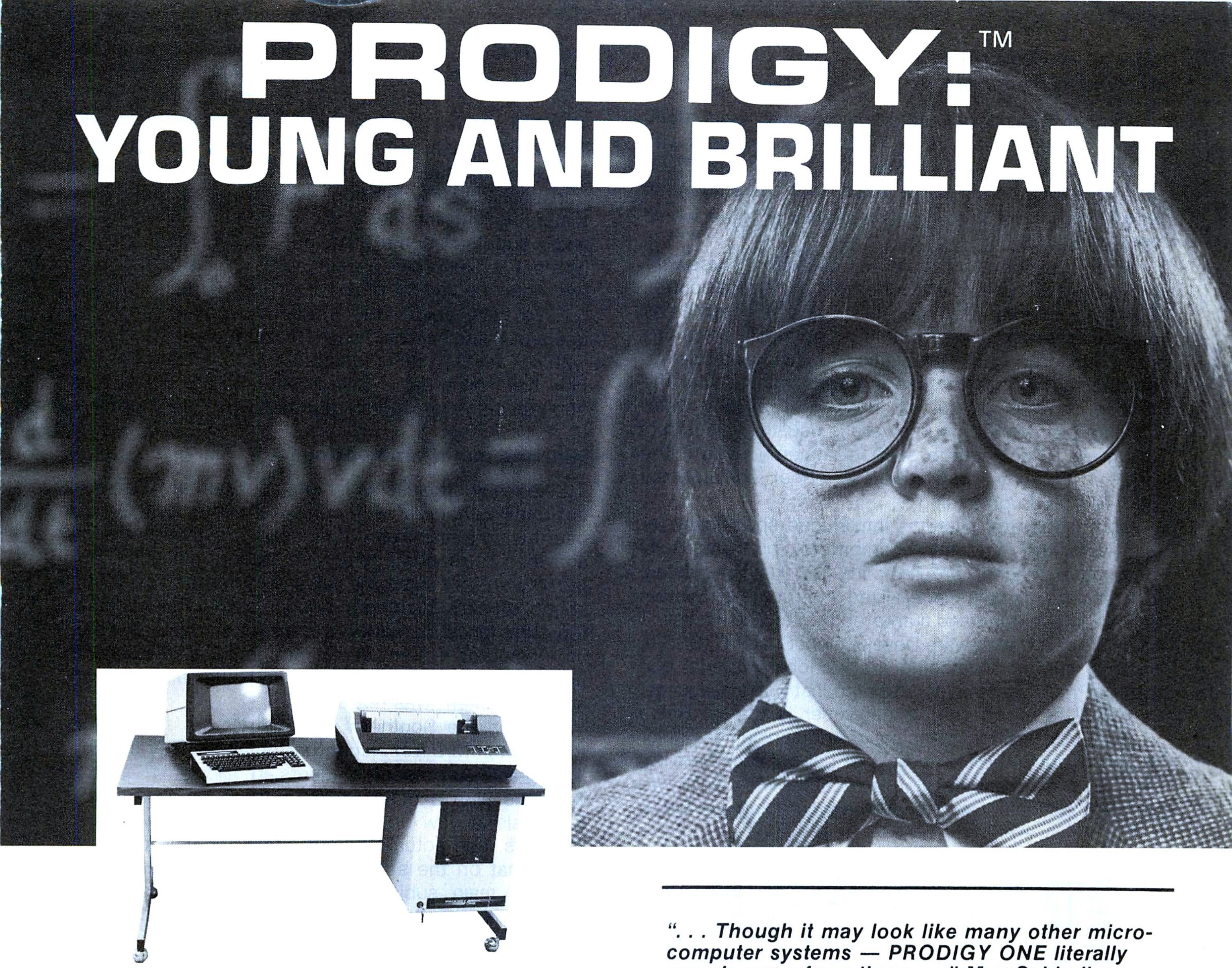

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Prodigy's easy to use compiler-based small business applications development lan guage. Prodigy also supports other popular languages such as FORTRAN, COBOL, BASIC, and PASCAL.

Micros in Education

Continued from page 70

Another reason is that some courses lend themselves to teaching sets of facts, as compared with courses that involve philosophical concepts and require strong personal interaction with the student. In this situation, it's unlikely that a canned program would ever be suitable.

When teachers prepare a custom courseware program, the contents are under their complete control. Special points can be emphasized and selected areas can be given detailed treatment. Remedial programs can be tailored to the problems of individual students. Another advantage of custom courseware is that the teacher can modify it or add to it at any time. Commercial canned courseware is usually deliberately designed to discourage such treatment—even if the teacher is fairly knowledgeable about conventional commercial programming.

One of the first systems introduced specifically for use with the new microcomputers, providing fully interactive teacher programming for truly interactive courseware, is the Generalized Instructional System (GENIS) developed and marketed by Bell and Howell. It consists of a Courseware Development System I (CDS I), a program for developing instructional material and MARK-PILOT, a computer-assisted instruction language.

A typical report from a new user is that of Ralph Scazafabo, assistant principal of Addison Junior-Senior High School in the Southern Tier school near Corning, NY. First experiments at this location were with two Apple II systems. Results were encouraging and led to the purchase of 15 Bell and Howell microcomputer systems, a special version of the Apple II modified specifically for education. This version contains the identical internal working parts of the Apple II Plus and incorporates some features that make it more suitable for classroom use. These include a handle for easy transport, a safety interlock to prevent students from tampering with the electronics inside the unit, and two audio outlets become 3 AC outlets. Included also are headset and external speaker jacks, volume control, and two video inputs that allow for small or large group use.

"We have about 300 students who are potential users of these micros," says Scazafabo, "initial results with our first 15 units justified 15 more units that we now have on order." Still more units are planned as soon as some applied-for grants have been approved.

Mini and mainframe options

Like many other school systems, Southern Tier was not totally unfamiliar with computer systems; they had been using a mainframe time-sharing system for such activities as recordkeeping and student guidance. But these were not used for classroom instruction. When school officials decided to bring in classroom systems, they first investigated the possibility of working with a minicomputer system or mainframe on a time-sharing basis, but decided the expense and inflexibility of such an arrangement was not suitable.

Plans in the Southern Tier district are to use the microcomputers from kindergarten all the way through 12th grade. At present, students are allowed 15-minute sessions with a micro, two to three times a week. Emphasis is now on remedial courseware for slower students, and actual student computer time depends somewhat on the student's need. Reading and math are the main subjects. Some students are taking courses in how to program the microcomputer, and science courses will be added shortly.

"We're finding 'canned' courseware to be in short supply," Scazafabo says. "To help remedy this problem, we'll make the micros available to a number of teachers during the summer months, so they can prepare GENIS courseware for the next school year."

The story is very similar at another school system just beginning to get into classroom micro techniques. Michael Eisenberg, head library media specialist at the Industrial Communications center in the Fayetteville Manlius school district in New York, reports that many teachers are excited about the possibilities raised by the high school division's first three Bell and Howell units. District wide, there are 10 units. About 500 students are eligible to share these units.

Subjects now computer-taught include music, languages, math, science and social studies. "Students actually fight over who gets time on the micros. We use a sign-up system to keep order," Eisenberg says, "we try to keep about a 60/40 ratio between micro classroom instruction time and free time in which students can work on their own—usually learning to program in Basic." Microcomputer time is assigned in 20-minute blocks.

"The classroom micro is the greatest boom *in the* education field since the invention of the pencil," Eisenberg says. "But," he adds, "the teacher must still provide the all-important human element. Without a teacher, the best classroom computer system in the world is still inadequate."□

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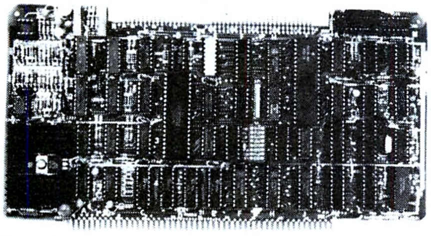

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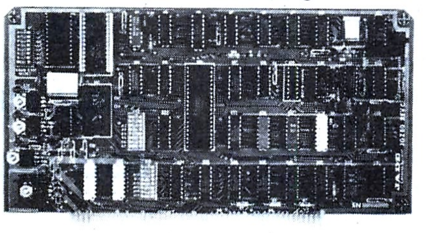

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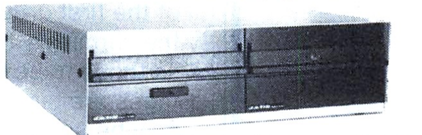

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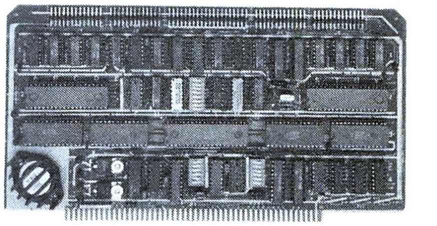

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Guide to Computer-Based Training Systems

Continued from page 74

a ready-to-use training course. It is a course development effort, as is traditional, with the developer using an author language and terminal instead of the typewriter. This means that the developer will have to learn how to use this language, which will cost some time and money. However, this seems to be rather insignificant for a career trainer. The authoring languages usually give the developer the ability to individualize training, so that only what is needed is delivered to the trainee. If remedial assistance is necessary, it can also be prescribed. Most authoring languages allow considerable animation and simulation, which potentially could cut the expenses for test equipment and other hardware that may be necessary, but are only used sporadically through the training. Many other media (slides, video tape, film) may be programmed into the lessons through the use of an author language.

On the other side is the delivery system. This consists of the hardware from which the training will be delivered and the courseware (course software) that constitutes the lesson material and guide. Common CBT delivery systems are made up of a CRT terminal and associated hardware with a software source. This will be more evident as each system type is examined.

There are several steps in selecting a CBT system, first being the identification of training needs, specifically those where CBT applications will work best. This can be divided into two areas: the need to manage instruction, provide remedial actions, validate mastery, automate record keeping and give feedback to trainees; and provision of simulations and drill and practice sessions for proficiency.

Next, it is necessary to determine whether courseware already exists to fill the training need. And if so, is it available for lease or purchase? If the courseware is not available, will it be more cost effective to have a vendor produce it or to develop the courseware in-house? One should then develop a set of CBT selection guides, such as available courseware for a particular system, its authoring capabilities, necessary operating environment and cost. It's also wise to look at alternative CBT systems. When you have examined one, compare it to the others. Make your selection, based on all the facts. There will be support from the vendors to help after the decision is made.

The disadvantages may be associated with too much centralization

There are three basic types of CBT systems currently available. Examples of each are included in the accompanying chart, which demonstrates prime capabilities necessary for a viable CBT system.

First is the multiple terminal system that requires a processor devoted solely to training delivery. The dedicated processor system devotes all its computing power to the delivery of training, giving vast centralized storage for courseware and records and allowing communications between students and instructors, or between authors. The disadvantages may also be associated with too much centralization, where every student may be affected by a problem in the computer and the necessity for specialized terminals. The systems we have included in the chart are SIMPLER and TICCIT.

A multiple terminal system is one that runs under the overall operating system of a mainframe computer, such as an IBM 370, where training is just another client program. This type of system has the advantages of the first group, plus it uses an existing computer and the terminals for hands-on courses that are the same as those to be used later in the real world. Its disadvantages are similar to the first group; however, a priority may be set and the execution of response time may be slower than in the first group. Also, certain additions of equipment may be needed to provide access to the system on a wide scale basis. The systems in the chart are DEC, IIS, PHOENIX, PLATO, S/T3 and UNIX/CAT.

The final category includes systems that use stand-alone microprocessor driven terminals, where the system is devoted to one user at a time. This makes it possible to set up the display screen much faster than the other two system types. There are no communication links. One trainee is not affected by another's computer problems and the investment tends to be smaller than with a large system. This also has some problems, since there is no easy way of distributing courseware, no centralized storage or access to the courseware, and no communication on a realtime basis with the instructor. This group is represented in the chart by PASS, RC-1 and SIMPL. □

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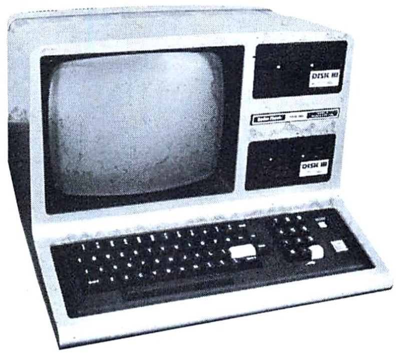

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Stock Market Investment Analysis
Continued from page 82

Program listing 1

```
100 CLS
110 PRINT "STOCK MARKET MOVING AVERAGE CALCULATOR"
120 REM STATEMENT DIRECTORY - LINES 60000-65000
130 PRINT "ROBERT E. WILSON - JAN - 1981"
140 CLEAR 768
150 DEFINT I,J,N,X
160 REM INTEGER VAR - I, J, K, NS, NW, X, XT
170 REM SINGLE  VAR - AV(), P(), PL, PM, PN, PT, PU
180 REM STRING  VAR - A$, B$, C$, DR$(), DT$, ID$(), IK$
190 NW = 28 : REM # OF WEEKS - 1
200 NS = 39 : REM # OF STOCKS - 1
210 PM = 999.99 : REM MAXIMUM PRICE ALLOWED
220 KK = 0
230 DIM ID$(NS), DR$(NS), AV(NS), P(NS,NW)
240 REM CLEAR STOCK MEMORY
250 PRINT @320, "CLEARING SPACE FOR STOCK #";
260 FOR I=0 TO NS
270   PRINT @347, I+1;
280   ID$(I) = "ZZZZ"
290   DR$(I) = "------"
300   AV(I)  = 0
310   FOR J=0 TO NW
320     P(I,J) = 0
330   NEXT J
340 NEXT I
350 PRINT
360 PRINT
370 INPUT "WHAT IS TODAY'S DATE? (6 CHAR)"; DT$
380 DT$=LEFT$(DT$,6) : REM CUTOFF AT 6
390 IF LEN(DT$)>5 THEN GOTO 440
400 FOR I=LEN(DT$) TO 5 : REM STRETCH TO 6
410   DT$ = DT$ + " "
420 NEXT I
430 REM BUILD MENU ON SCREEN
440 CLS
450 ON ERROR GOTO 0
460 PRINT "STOCKS ARE:          ";NW+1;"WEEK MOVING AVERAGE CALCULATOR - ";DT$
470 FOR I=0 TO NS
480   J = 64 + 16*I
490   IF ID$(I)="ZZZZ" THEN 520
500   PRINT @J, ID$(I); AV(I);
510 NEXT I
520 PRINT
530 PRINT STRING$(63,"-")
540 PRINT "CHOICES ARE: 1=UPDATE, 2=ADD NEW, 3=DELETE, 4=SCALE SPLITS"
550 PRINT "                5=READ TAPE, 6=WRITE TAPE, 7=PLOT"
560 J = FRE(K$)
570 PRINT "WHICH WOULD LIKE TO DO ("; KK; ")   ";
580 INPUT KK
590 PRINT STRING$(192,8);
600 IF KK<1 OR 7<KK THEN GOTO 440
610 ON KK GOSUB 1020 , 2020 , 3010 , 4020 , 5010 , 6010 , 7020
620 GOTO 440
630 '
640 '
1000 REM UPDATE STOCK PRICES
1010 REM FETCH POINTER
```

```
2340 RETURN
2350 REM DELAY TO SHOW MESSAGE
2360 FOR I=0 TO 300
2370 NEXT I
2380 RETURN
2390 '
2400 '
3000 REM SUBROUTINE  DELETE STOCK
3010 PRINT "WHICH STOCK DO YOU WANT TO ERASE  ( "; IK$; " ) ";
3020 INPUT IK$
3030 REM FETCH POINTER
3040 GOSUB 8010
3050 IF IK$<>ID$(X) THEN GOTO 3360
3060 REM DISPLAY DATA FOR CHECK
3070 GOSUB 9010
3080 REM DOUBLE CHECK
3090 INPUT "IS THIS THE ONE TO DELETE? (Y/N)"; K$
3100 K$ = LEFT$(K$,1)
3110 IF K$<>"Y" THEN GOTO 3390
3120 PRINT "JUST A MINUTE WHILE I FILL IN THE GAP";
3130 REM CLOSE UP THE GAP
3140 IF X=NS THEN GOTO 3290
3150 XT  = X
3160 IK$ = "ZZZZ"
3170 GOSUB 8010
3180 IF X>NS THEN X=NS
3190 FOR I=XT TO X-1
3200   PRINT I+1;
3210   ID$(I) = ID$(I+1)
3220   DR$(I) = DR$(I+1)
3230   AV(I)  = AV(I+1)
3240   FOR J=0 TO NW
3250     P(I,J) = P(I+1,J)
3260   NEXT J
3270 NEXT I
3280 REM BLANK OUT LAST ENTRY
3290 ID$(X) = "ZZZZ"
3300 DR$(X) = "------"
3310 AV(X)  = 0
3320 FOR I=0 TO NW
3330   P(X,I) = 0
3340 NEXT I
3350 GOTO 3390
3360 PRINT CHR$(34); IK$; CHR$(34); " NOT FOUND"
3370 FOR I=0 TO 300
3380 NEXT I
3390 RETURN
3400 '
3410 '
4000 REM SUBROUTINE  ADJUST PRICE FOR SPLITS
4010 REM FETCH POINTER
4020 PRINT "WHICH STOCK DO YOU WANT TO ADJUST  ( "; IK$; " ) ";
4030 INPUT IK$
4040 GOSUB 8010
4050 IF IK$<>ID$(X) THEN GOTO 4200
4060 REM PUT ONTO SCREEN
4070 GOSUB 9010
4080 PRINT "ENTER ZERO OR NEGATIVE TO END PROCESS"
4090 PT = 0
4100 INPUT "HOW MANY NEW SHARES FOR OLD"; PT
4110 IF PT<=0 THEN GOTO 4200
4120 AV(X) = 0
4130 FOR I=0 TO NW
4140   P(X,I) = INT(0.5 + 100*P(X,I)/PT) / 100
4150   IF P(X,I)>PM THEN P(X,I)=PM
4160   AV(X) = AV(X) + P(X,I)
4170 NEXT I
4180 AV(X) = INT(100*AV(X)/(NW+1))/100
```

```
1020 PRINT "WHICH STOCK DO YOU WANT TO UPDATE  ( "; IK$; " ) ";
1030 INPUT IK$
1040 GOSUB 8010
1050 IF IK$<>ID$(X) THEN 1330
1060 PT = P(X,0)
1070 REM PUT HEADER ON SCREEN
1080 GOSUB 9010
1090 PRINT "ENTER 0 TO STOP, OR NEGATIVE TO BACK UP ONE STEP"
1100 PN = 0
1110 INPUT "WHAT IS THE NEXT PRICE"; PN
1120 IF PN>PM THEN PN=PM
1130 IF PN>0 THEN GOTO 1240
1140 IF PN=0 THEN GOTO 1330
1150 REM OOPS...BACK UP ONE
1160 AV(X) = AV(X)*(NW+1) - P(X,NW)
1170 FOR I=NW TO 1 STEP -1
1180   P(X,I) = P(X,I-1)
1190 NEXT I
1200 P(X,0) = PT
1210 AV(X) = INT(100*(AV(X)+PT)/(NW+1))/100
1220 GOTO 1080
1230 REM OK...PUT IT IN
1240 PT     = P(X,0)
1250 AV(X) = (NW+1)*AV(X) - PT
1260 FOR I=0 TO NW-1
1270   P(X,I) = P(X,I+1)
1280 NEXT I
1290 P(X,NW) = INT(PN*100 + 0.5) /100
1300 AV(X) = INT(100*(AV(X)+PN)/(NW+1))/100
1310 DR$(X) = DT$
1320 GOTO 1080
1330 RETURN
1340 '
1350 '
2000 REM SUBROUTINE  ADD NEW STOCK
2010 REM FIND FIRST OPENING
2020 IK$ = "ZZZZ"
2030 GOSUB 8010
2040 IF IK$=ID$(X) THEN GOTO 2070
2050 PRINT "NO EMPTY SPACE LEFT"
2060 GOTO 2360
2070 INPUT "WHAT IS TICKER SYMBOL?  (UP TO 4 CHAR)"; IK$
2080 XT = X
2090 GOSUB 8010
2100 IF IK$<>ID$(X) THEN GOTO 2150
2110 PRINT "THAT IS A DUPLICATE"
2120 FOR I=0 TO 300
2130 NEXT I
2140 GOTO 2340
2150 IF X=XT THEN GOTO 2260
2160 PRINT "JUST A MINUTE WHILE I MAKE ROOM"
2170 FOR I=XT-1 TO X STEP -1
2180   ID$(I+1) = ID$(I)
2190   DR$(I+1) = DR$(I)
2200   AV(I+1)  = AV(I)
2210   FOR J=0 TO NW
2220     P(I+1,J) = P(I,J)
2230   NEXT J
2240 NEXT I
2250 REM BLANK OUT VALUES FOR NEW DATA
2260 ID$(X) = IK$
2270 DR$(X) = DT$
2280 INPUT "WHAT IS CURRENT OR AVERAGE PRICE"; PN
2290 PN = INT(0.5+100*PN)/100
2300 FOR I=0 TO NW
2310   P(X,I) = PN
2320 NEXT I
2330 AV(X) = PN
```

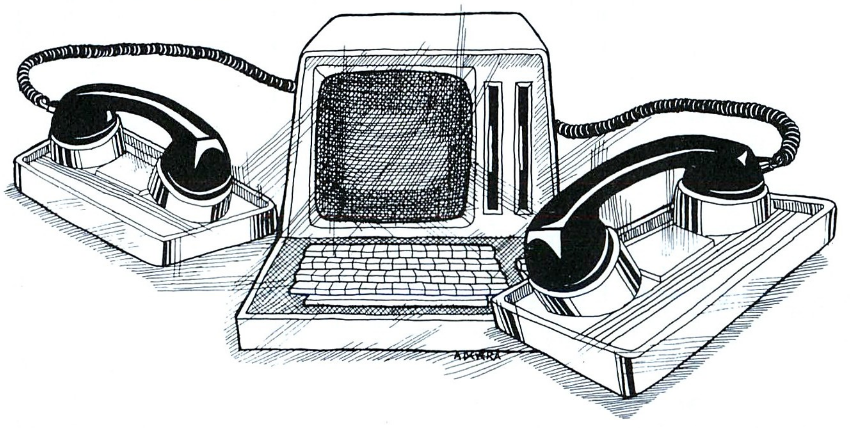
```
4190 GOTO 4070
4200 RETURN
4210 '
4220 '
5000 REM SUBROUTINE READ FROM CASSETTE
5010 INPUT "TO READ CASSETTE, PUSH 'PLAY', AND ENTER 'Y' WHEN READY";IK$
5020 IK$ = LEFT$(IK$,1)
5030 IF IK$<>"Y" THEN GOTO 5340
5040 ON ERROR GOTO 5360
5050 I = FRE(IK$)
5060 FOR I=0 TO NS
5070   PRINT CHR$(29); CHR$(30); "READING STOCK #"; I+1; "...";
5080   INPUT #-1,A$,B$,C$
5090   PRINT "NOW UNPACKING...";
5100   ID$(I) = LEFT$(A$,4)
5110   IF ID$(I)="ZZZZ" THEN GOTO 5340
5120   DR$(I) = RIGHT$(A$,6)
5130   REM GET AVERAGE
5140   AV(I)   = VAL(B$)
5150   K       = LEN(B$)-LEN(STR$(AV(I)))-1
5160   B$      = RIGHT$(B$,K)
5170   FOR J=0 TO (NW/2-1)
5180     P(I,J) = VAL(B$)
5190     K       = LEN(B$)-LEN(STR$(P(I,J)))-1
5200     B$      = RIGHT$(B$,K)
5210   NEXT J
5220   J = NW/2
5230   P(I,J) = VAL(B$)
5240   FOR J=(1+NW/2) TO (NW-1)
5250     P(I,J) = VAL(C$)
5260     K = LEN(C$) - LEN(STR$(P(I,J))) - 1
5270     C$ = RIGHT$(C$,K)
5280   NEXT J
5290   P(I,NW) = VAL(C$)
5300   X=I
5310   GOSUB 9010
5320   PRINT "HERE IS THE DATA READ IN FOR STOCK #"; I+1
5330 NEXT I
5340 RETURN
5350 REM ERROR HANDLER
5360 IF ERL>5000 AND ERL<5350 AND (ERR/2+1)=4 THEN RESUME 5340
5370 ON ERROR GOTO 0
5380 '
5390 '
6000 REM SUBROUTINE WRITE TO CASSETTE
6010 INPUT "TO WRITE, PUSH 'RECORD' & 'PLAY', AND ENTER 'Y' WHEN READY"; IK$
6020 IK$ = LEFT$(IK$,1)
6030 IF IK$<>"Y" THEN GOTO 6220
6040 FOR I=0 TO NS
6050   X=I
6060   GOSUB 9010
6070   PRINT CHR$(29); CHR$(30); "PACKING STOCK #"; I+1; "...";
6080   A$ = ID$(I) + DR$(I)
6090   B$ = STR$(AV(I)) + "/"
6100   FOR J=0 TO (NW/2-1)
6110     B$ = B$ + STR$(P(I,J)) + "/"
6120   NEXT J
6130   B$ = B$ + STR$(P(I,NW/2))
6140   C$ = ""
6150   FOR J=(1+NW/2) TO (NW-1)
6160     C$ = C$ + STR$(P(I,J)) + "/"
6170   NEXT J
6180   C$ = C$ + STR$(P(I,NW))
6190   PRINT "NOW WRITING...";
6200   PRINT #-1, A$, B$, C$
6210   IF ID$(I)="ZZZZ" THEN GOTO 6230
6220 NEXT I
6230 RETURN
```

```
6240 '
6250 '
7000 REM PLOT PICTURE OF STOCK PRICES
7010 REM FETCH POINTER
7020 PRINT "WHICH STOCK DO YOU WANT TO PLOT  ( "; IK$; " ) ";
7030 INPUT IK$
7040 GOSUB 8010
7050 IF IK$<>ID$(X) THEN GOTO 7380
7060 CLS
7070 REM FIND MAX AND MIN
7080 PL = P(X,0)
7090 PU = P(X,0)
7100 FOR I=1 TO NW
7110   IF PL>P(X,I) THEN PL = P(X,I)
7120   IF PU<P(X,I) THEN PU = P(X,I)
7130 NEXT I
7140 REM ADJUST TO EVEN TENS
7150 PL = 10 * INT(PL/10)
7160 PU = 10 * INT(0.99 + PU/10)
7170 REM SET UP SCREEN
7180 PRINT @4, CHR$(151);STRING$(57,131);CHR$(171);
7190 PRINT @836, CHR$(181);STRING$(57,176);CHR$(186);
7200 FOR I=1 TO 12
7210   PRINT @64*I+4,CHR$(149);STRING$(57,128);CHR$(170);
7220 NEXT I
7230 PRINT @0, PU;
7240 PRINT @832, PL;
7250 PRINT @922, IK$; " "; DR$(X);
7260 REM PLOT PRICE VALUES
7270 PT = 40 * (PU-AV(X)) / (PU-PL)
7280 PRINT @64*INT(PT/3), "AVE";
7290 FOR K=0 TO NW
7300   I = 10 + K*4
7310   J = 40 * (PU-P(X,K)) / (PU-PL)
7320   SET(I,J)
7330   I = I + 2
7340   SET(I,PT)
7350 NEXT K
7360 PRINT @998, "PRESS RETURN WHEN READY";
7370 INPUT IK$
7380 RETURN
7390 '
7400 '
8000 REM SUBROUTINE TO FETCH STORAGE POINTER
8010 X = NS : REM SET TO HIGHEST VALUE
8020 IK$ = LEFT$(IK$,4) : REM CUTOFF AT 4
8030 IF LEN(IK$)>3 THEN GOTO 8070
8040 FOR I=LEN(IK$) TO 3 : REM EXPAND TO 4
8050   IK$ = IK$ + " "
8060 NEXT I
8070 FOR I=(NS-1) TO 0 STEP -1
8080   IF IK$<=ID$(I) THEN X=I
8090 NEXT I
8100 RETURN
8110 '
8120 '
9000 REM SUBROUTINE TO PUT STOCK PRICE DATA ON SCREEN
9010 CLS
9020 PRINT "STOCK: "; ID$(X), "AVERAGE:"; AV(X), "DATE: "; DR$(X)
9030 FOR K=0 TO NW
9040   PRINT @64+8*K, P(X,K);
9050 NEXT K
9060 PRINT : PRINT STRING$(63,"-")
9070 RETURN
9080 '
9090 '
```

Listing 2

```
140 CLEAR 512
5000 REM SUBROUTINE READ FROM TAPE
5010 INPUT "TO READ WAFER, INSERT, AND PRESS 'ENTER' WHEN READY (Y/N) "; IK$
5020 IK$ = LEFT$(IK$,1)
5030 IF IK$<>"Y" THEN GOTO 5170
5040 ON ERROR GOTO 5190
5050 @CLEAR
5060 PRINT "REWINDING...";
5070 @OPEN1
5080 PRINT "READING...";
5090 FOR I=0 TO NS
5100   @INPUT ID$(I), DR$(I), AV(I)
5110   IF ID$(I)="ZZZZ" THEN GOTO 5160
5120   FOR J=0 TO NW
5130     @INPUT P(I,J)
5140   NEXT J
5150 NEXT I
5160 @CLOSE
5170 RETURN
5180 REM ERROR CONDITIONS
5190 K=ERR/2+1
5200 IF K=4 OR K=22 THEN RESUME 5170
5210 IF K<>2 THEN 5250
5220 CLS
5230 PRINT "ESF DATA I/O NOT LOADED"
5240 PRINT "LOAD THAT WAFER, THEN RELOAD THIS PROGRAM"
5250 ON ERROR GOTO 0
5260 '
5270 '
6000 REM SUBROUTINE WRITE TO TAPE
6010 INPUT "TO WRITE, INSERT WAFER (>20'), AND ENTER WHEN READY (Y/N) "; IK$
6020 IK$ = LEFT$(IK$,1)
6030 IF IK$<>"Y" THEN GOTO 6180
6040 ON ERROR GOTO 6200
6050 @CLEAR
6060 PRINT "REWINDING...";
6070 @OPEN1
6080 PRINT "WRITING...";
6090 FOR I=0 TO NS
6100   @PRINT ID$(I), DR$(I),' AV(I)
6110   FOR J=0 TO NW
6120     @PRINT P(I,J)
6130   NEXT J
6140   IF ID$(I)="ZZZZ" THEN GOTO 6160
6150 NEXT I
6160 PRINT "DONE"
6170 @CLOSE
6180 RETURN
6190 REM ERROR CONDITIONS
6200 K=ERR/2+1
6210 IF K=22 THEN RESUME 6180
6220 IF K<>2 THEN 6260
6230 CLS
6240 PRINT "ESF DATA I/O ROUTINES NOT LOADED"
6250 PRINT "LOAD THAT WAFER, THEN RELOAD THIS PROGRAM"
6260 ON ERROR GOTO 0
6270 '
6280 '
60070 GOTO 5000: REM READ DATA - STRINGY FLOPPY
60090 GOTO 6000: REM WRITE DATA - STRINGY FLOPPY
```

The General
Continued from page 107



Program listing

```
program terminal;

(*                    "THE GENERAL"                      *)
(*              A General Purpose Terminal               *)
(*      Modem/Disk Ver.1.4, Pascal/MT 3.2,CPM 2.2        *)

const
   {Ascii conventions.}
   soh = 1; esc = 27; ack = 6; nak = 21; stx = 2; etx = 3;
   enq = 5; bel = 7; dc3 = 19; dc2 = 17; dc1 = 17; dle = 16;
   sub = $1a; cr = 13; lf = 10; ht = 9; rub = 127; nul = 0;

{ Convert character to uppercase }
begin
   if (inchar >= 'a') and (inchar <= 'z') then
      ucase := chr( ord(inchar) & $5f)
   else ucase := inchar;
end;

procedure repchar(ch : char; i : integer);
begin
  while i > 0 do
  begin
    write(ch); i := i - 1;
  end;
end;

function keypressed : boolean;
var
   chrint : integer;
begin

   {test bit 0 per PMT extensions}
   chrint := input[keystat];
   keypressed := not(tstbit(chrint,0));

  {test bit 0 with standard Pascal }
  { if odd(ord(inchar)) then keypressed := false
   else keypressed := true; }

end;

function dataready : boolean;
var
   inchar : char;
begin {Test bit 6}
   inchar := input[serstat];
   dataready := ( ord(inchar) and sermask ) > 0;
end;

function notafile(var title : filename) : boolean;
var
   f : text; result : integer;
begin
   open(f,title,result);
   notafile := (result = 255);
end;{notafile}

procedure readstr(var s:string);
```

```
    {Sol-20 i/o ports & masks.}
    keystat = 250; keydata = 252; serstat = 248; serdata = 249;
    uartmask = 128; sermask = 64; keymask = 1;

    {Sizes of capture buffer, i/o buffer, & file control block}
    mbufsize = 28671; bufsize = 127; fcblen = 12;

    nofile = 255; maxstrlen = 40;

 type
    string = record  {For console string input.}
           len : integer;
           val : array[1..maxstrlen] of char;
      end;

    filename = packed array[0..11] of char;
    buffer = packed array[0..bufsize] of char;

 var
    instr : string;  {Console input string.}
    outstr : string; {Formatted to CPM fcb.}

    mainbuff : packed array[0..mbufsize] of char;{Capture buffer}

    iofile : filename;
    f : text;
    startsig, endsig, ch, key     : char;
    autocap, autoline, echo : boolean; {Option switches}

    outdevice, mainptr, i, fcb,
    bufptr, rekcount, byte, flag : integer;



 (*              general-purpose procedures/functions            *)


 procedure external[5] sobdos(func : integer ; outchar : char);
 procedure external[0] warmboot;

 procedure clearscreen;
 begin
    write(chr(11));  { Sol/VDM video protocol }
 end;

 function ucase(inchar : char) : char;
```

```
  {Character-oriented routine to enter/edit input}
  {string -- adapted to SOL/VDM screen convention}
  var
    i : integer; ch : char;
  begin
    s.val[1] := ' ';
    move(s.val[1],s.val[2],maxstrlen - 1); {blank string}
    s.len := 0;
    repeat
      read(ch);
      case ch of
      $0d: {carriage return}
          EXIT;
      $7f : {delete key }
          begin
            if s.len > 0 then
              begin
                 {blank deleted char in record}
                 s.val[s.len] := ' ';
                 s.len := s.len - 1;
                 {blank deleted char on screen - Sol/VDM}
                 write(chr(1),' ',chr(1))
              end
          end;
      else {a new character}
        if (ch >= ' ') and (s.len < maxstrlen) then
          begin
            s.len := succ(s.len);
            s.val[s.len] := ch
          end
      end {case}
    until false; {forever loop}
  end; {readstr}


  procedure nameparser(var in,out:string);
  {PMT library: parse filename to fcb format}
  {Requires utility function ucase(ch:char) }
  var
     i,j : integer;
  begin
    out.len := 0; out.val[1] := ' ';
    move(out.val[1],out.val[2],11); {Blank output buffer}
    out.val[1] := chr(0); {Default is current disk}
    i := 1; j := 2;
    if in.val[i+1] = ':' then {Disk was specified}
      begin
```

```
      out.val[1] := chr(ord(in.val[1])-ord('A'));
      i := i + 2
    end;
  while (i <= in.len) and (in.val[i] <> '.') do
    begin
      out.val[j] := ucase(in.val[i]);
      j := j + 1; i := i + 1
    end;
  if i > in.len then
    EXIT;
  i := i + 1; {Skip}
  j := 10; {Point to extension location within array}
  while (i <= in.len) and (J <= fcblen) do
    begin
      out.val[J] := ucase(in.val[i]);
      j := j + 1; i := i + 1;
    end
end; {nameparser}



(*              program-specific procedures              *)

procedure setbuffer;
begin
  mainptr := 0; {Reset}
  mainbuff[0] := chr($1a); {EOF mark}
  move(mainbuff[0],mainbuff[1],mbufsize);{Fill}
  writeln('* BUFFER is set! *');
end;


procedure sendfile; {Disk to modem.}
var
   inbuf  : buffer; inchar : char;
   instr,outstr : string;
begin
  clearscreen;
  write('To SEND a file, ENTER name>');
  readstr(instr);
  nameparser(instr,outstr);
  move(outstr.val[1],iofile[0],fcblen);
  writeln('Opening file: ', iofile);
  open(f,iofile,flag);
  if flag = nofile then
    begin
```

```
end; {sendfile}



procedure recfile(var ptr : integer);
{ Modem to text buffer }
procedure capture;
var
  rch : char;
begin {capture}
rch := chr(0); { initialize! }
clearscreen;
writeln('Capturing message. CTRL-C aborts.');
   repeat
      if Keypressed then
        begin
           rch := input[keydata];
           if ord(rch) = etx then
              begin; writeln('* STOP capture *'); EXIT; end;
        end;
      if dataready then
         begin
            if (ptr > mbufsize) then
                begin
                   ptr := mbufsize;
                   writeln('* The GENERAL''s buffer is FULL *');
                   EXIT;
                end;
            rch := input[serdata];
            rch := chr(ord(rch) & $7F); {strip parity}
            if (rch = endsig) then EXIT; { to display; }
            mainbuff[ptr] := rch;
            write(rch);
            if autoline then
               if rch = chr(cr) then
                  begin
                    ptr := ptr + 1;
                    mainbuff[ptr] := chr(lf);
                  end;
               if ptr mod 128 = 0 then
                  begin
                    writeln;
                    writeln('Space: ',mbufsize - ptr);
                  end;
            ptr := ptr + 1;
         end;
```

```
      writeln('File NOT found.'); exit
    end;

  writeln('* TRANSMITTING file *');
  rekcount:= 0;

  if autocap then sobdos(outdevice, startsig);
  repeat
    bufptr := 0; inbuf[0] := 0;
    move(inbuf[0],inbuf[0],bufsize); {zero buffer}
    blockread(f,inbuf,flag); {read 128-byte record}
    if flag <> 0 then
        begin
          writeln('* TRANSMIT complete! *'); exit
        end
    else
    repeat
       ch := inbuf[bufptr];
       if ord(ch) = $1a then
          begin
            if autocap then
               begin
                 sobdos(outdevice,endsig);
               end;
            writeln('* TRANSMIT complete! *'); exit
          end;
       if keypressed then
          begin
            if autocap then
               begin
                 sobdos(outdevice,endsig);
               end;
            writeln('* STOP sending *'); exit
          end;
       if (ord(ch) = lf) then
          ch := chr(nul)
       else
          begin
            sobdos(outdevice,ch);
            if echo then write(ch);
          end;
        bufptr := bufptr + 1;
     until bufptr > bufsize;
     rekcount := rekcount + 1;
     writeln;
     writeln('Record NUMBER: ',rekcount);
  until false {Forever loop.}
```

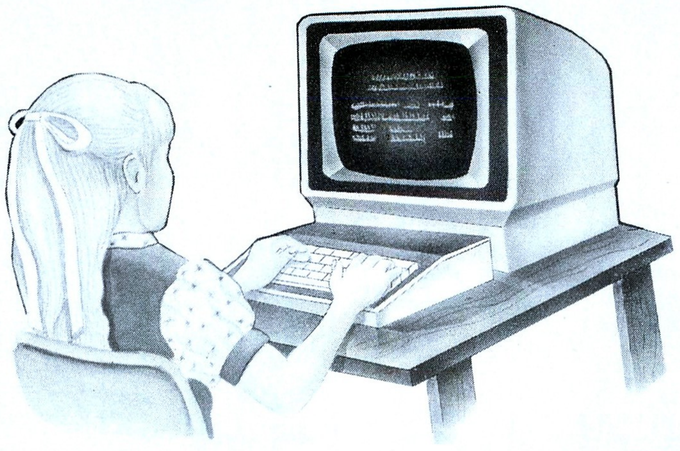
```
    until false; {forever loop};
end;{capture}

begin{recfile}
capture;
repeat {Pad remainder of record with EOF marks.}
   mainbuff[ptr] := $1a; ptr := ptr + 1;
until (ptr mod 128 = 0);
end;{recfile}



procedure putfile; {Store captured text on disk.}
var
   index, endmark : integer;
   outbuf   : buffer;
begin
  endmark := mainptr; index := (bufsize + 1);
  clearscreen;
  write('To SAVE buffer on disk, ENTER file name> ');
  readstr(instr);
  nameparser(instr,outstr);
  move(outstr.val[1],iofile[0],fcblen);

  if ( notafile(iofile) ) and (instr.len > 0) then
     begin
        create(f,iofile,flag);
        writeln('Creating ',iofile);
     end
  else
     begin { Don't overwrite existing file, instead... }
         iofile := ' AUTOFILE@   '; iofile[0] := chr(0);
           repeat
             {Increment number in filename}
             iofile[9] := succ(iofile[9])
           until notafile(iofile);
         create(f,iofile,flag);
         if flag = 255 then EXIT;
         write('Opening DEFAULT file: ');
         writeln(iofile);
     end;

   mainptr := 0; {Set pointer to front of capture buffer.}
   repeat
      move(mainbuff[mainptr],outbuf[0],index);
      blockwrite(f,outbuf,flag);
      if flag <> nul then
```

```
        begin
          writeln('* DISK write error *'); EXIT;
        end;
      mainptr := mainptr + index;
    until mainptr > (endmark-1);
    close(f,flag);
    writeln('* SAVED O.K. *');
    write('?> ');
  end; {putfile}


  procedure init;
  begin
    clearscreen; outdevice := 4;
    setbuffer;
    repchar('-',63);
    writeln('                    The GENERAL ............ Ver 1.4');
    writeln('                    Modem/Disk Terminal For CPM Users');
    repchar('-',63); writeln;

    { Defaults for protocol, duplex, lf insert, etc. }
    echo := true; autoline := false; autocap := false;
    startsig := chr(17); endsig := chr(19);

    writeln;
    write('                     Default protocol?'); read(key);

    if ucase(key) <> 'N' then EXIT;

    writeln;
    write('                     Echo to screen? ');read(key);
    echo := ( ucase(key) = 'Y' );
    writeln;
    write('                     Provide linefeed? ');read(key);
    autoline := (ucase(key) = 'Y');
    writeln;
    write('                     Automatic capture? ');read(key);
    autocap := ( ucase(key) = 'Y' );
    writeln;
    if autocap then
      begin
        clearscreen;
        write('ENTER automatic capture START character ');
        read(startsig); writeln;
        write('ENTER automatic capture STOP character ');
        read(endsig);
        writeln
      end;
  end; {init}


  procedure display;
  begin
  clearscreen;
  writeln
  ('-------------------- COMMANDS/FILENAMES ------------------');
  writeln
  ('CTRL-A will obtain this display.');
  writeln
  ('CTRL-E set echo, linefeed mode.  CTRL-Z, sets buffer.');
  writeln
  ('ESC quits. CTRL..F sends file,G receives file,P puts file.');
  writeln;
  writeln
  ('-------------------- TERMINAL STATUS --------------------');
  writeln('Text buffer size =     ',mbufsize + 1);
  if mainptr <> 0 then
     writeln('Space remaining   =     ',(mbufsize + 1)-mainptr )

  else
     writeln('Buffer pointer        is ZERO');

  if echo then
     writeln('Keyboard echo         is ACTIVE')
  else
     writeln('Keyboard echo         is INACTIVE');

  if autoline then
     writeln('Linefeed insert       is ACTIVE')
  else
     writeln('Linefeed insert       is INACTIVE');

  if autocap then
   begin
     writeln('Automatic capture     is ACTIVE');
     write('Start char = ',ord(startsig));
     writeln('      End char = ',ord(endsig));
   end
  else
     writeln('Automatic capture     is INACTIVE');

  repchar('-',58); writeln;
```

```
writeln(' The GENERAL is in keyboard/modem mode:');
write('?>'); { Key-to-modem prompt. }
end; {display}


(* ---------------------- main program -------------------- *)

begin
init; display;
repeat
   if dataready then
      begin
         ch := input[serdata];
         ch := chr(ord(ch) & $7F); { Strip parity.}

         case ord(ch) of
            dc1 :
               begin
                  if autocap then
                     begin
                        recfile(mainptr); display
                     end
               end;
            lf : ch := chr(nul); {Strip linefeed to CRT}
          end; {case}

         write(ch);
      end;
   if keypressed then
      begin
         ch := input[keydata];
         case ord(ch) of
{ESCAPE}    esc : EXIT; {Terminate program.}
{CTRL-A}    soh : begin display; ch := chr(nul); end;
{CTRL-E}    enq : begin init;display;ch := chr(nul); end;
{CTRL-F}    ack : begin sendfile; ch := chr(nul); end;
{CTRL-G}    bel : begin
                  recfile(mainptr); display; ch := chr(nul);
                 end;
{CTRL-P}    dle : begin putfile; ch := chr(nul); end;
{CTRL-Z}    sub : begin setbuffer; ch := chr(nul); end;
         end;{case}
         if ord(ch) > nul then sobdos(outdevice,ch);
         if echo then write({Echo to crt} ch);
      end;
until false; {Forever loop.}
end.
```

The Computer as a Learning Aid

Continued from page 109



Program listing

```
0   REM  EDUCATION & LEARNING AID PROGRAM
2   REM  APPLESOFT BASIC
10   HOME
20   DIM A$(2000)
25   VTAB 2: HTAB 2: INVERSE
30   PRINT "** EDUCATION & LEARNING AID PROGRAM **"
35   NORMAL
40   PRINT : PRINT
50   INPUT "** PLEASE ENTER START CHAPTER: ";ST
60   PRINT
70   INPUT "** PLEASE ENTER LAST CHAPTER: ";LL
80   PRINT
90   INPUT "** NORMAL OR RAPID REVIEW (N OR R)? ";RV$
100   PRINT
110   INPUT "** DO YOU WANT INTERACTION? (Y OR N)  ";IT$

120   IF CH = ST THEN I = 1: GOTO 140
130   IF CH >  = LL THEN  END
140 I = I + 1
150   NORMAL : HOME
160   READ A$(I)
170   IF A$(I) = "+" THEN  END
180   REM  "+" MUST BE LAST DATA STATEMENT
190   IF A$(I) = "*" THEN CH = CH + 1: GOTO 120
200   IF CH < ST THEN 140
210   VTAB 3
220   PRINT "** ";A$(I)
230   PRINT : PRINT
240   IF IT$ <  > "Y" THEN 270
250   INPUT T$: PRINT : PRINT
260   GOTO 290
270   CALL  - 756
280   REM  WAIT FOR KEY PRESS
290 I = I + 1
300   READ A$(I)
310   PRINT "> ";A$(I)
320   CALL  - 756
330   IF RV$ = "R" THEN 140
340   HOME
350   VTAB 3
360   PRINT "** ";A$(I - 1)
370   PRINT : PRINT
380 X =  PEEK (37)
390   REM  READS VERT TAB
400   SPEED= 150: INVERSE
410   PRINT "> ";A$(I)
420   CALL  - 756

430   VTAB X
440   CALL  - 958
450   VTAB X + 1
460   NORMAL : SPEED= 255
470   FOR Y = 1 TO 500: NEXT Y
480 A = A + 1
490   PRINT "> ";A$(I)
500   VTAB X + 1
510   CALL  - 958
520   REM  CLEARS SCREEN BELOW CURSOR
530   IF A < 4 THEN 470
540 A = 0
550   NORMAL
560   PRINT "> ";A$(I)
570   CALL  - 756
580   SPEED= 255
590   GOTO 140
1000   REM  ALL DATA STMTS OCCUR BELOW
1010   DATA  *: REM  CHAPTER DIVISION
1020   DATA  WHAT COLOR IS AN ORANGE?,BABY ORANGES ARE
      GREEN BUT TURN ORANGE AS THEY RIPEN
2000   DATA  +
```

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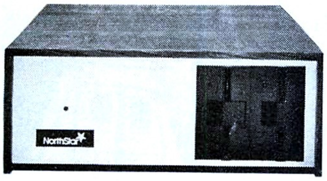

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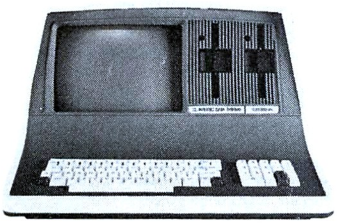

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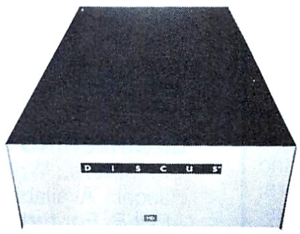

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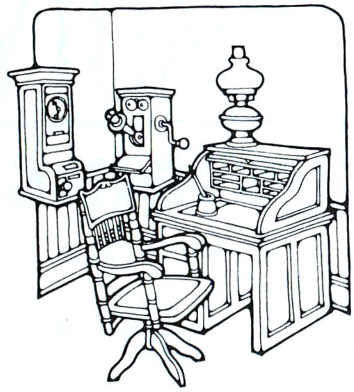

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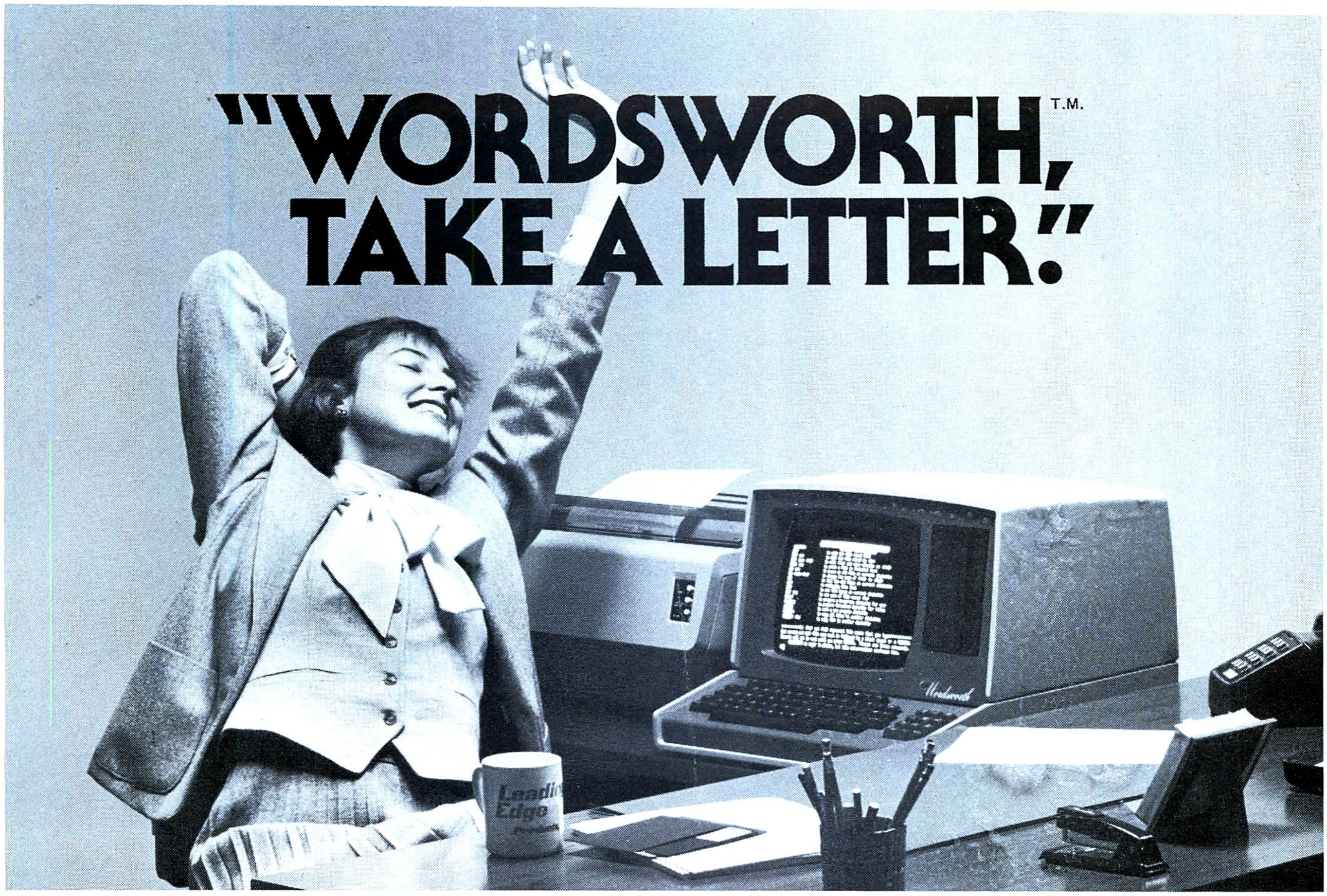

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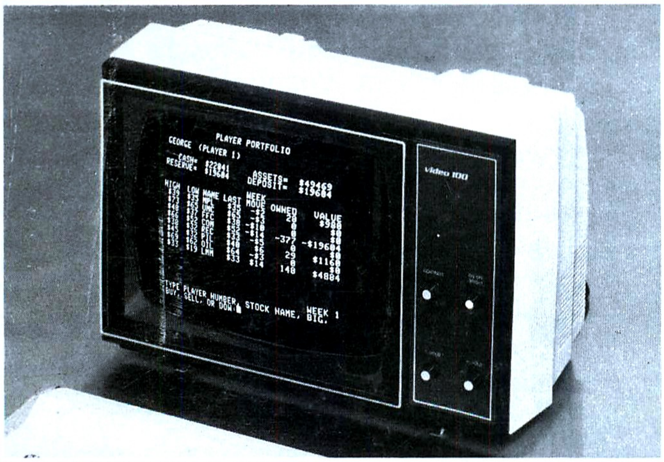

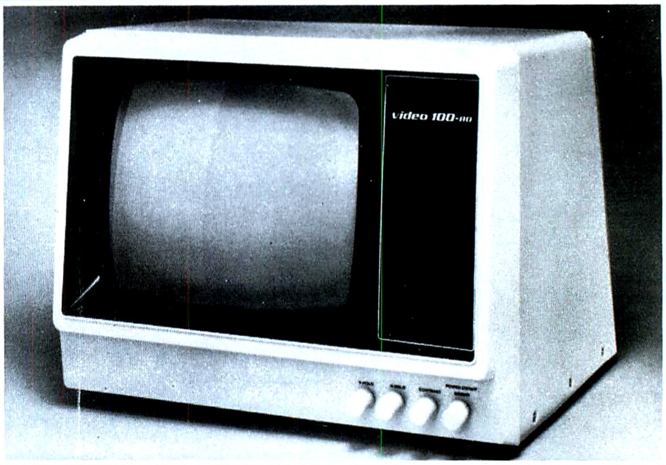

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